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ABSTRACT

Brazilian environmental education and training experience is recent but has a concrete base of generating awareness among all levels of the population and also aims to train people to protect, control and manage the use of environmental resources. Several visits were made by the author to organizations, enterprises and institutions from federal, state and municipal governments that are directly and indirectly involved with environmental affairs. Contacts were also made with non governmental organizations (NGOs) and private environmental initiatives to analyze and compare alternative paths in the Brazilian environmental education and training process. This study surveyed the institutions dealing directly or indirectly with environmental concerns of the Brazilian states of Minas Gerais, Parana, Rio de Janeiro, Rio Grande do Sul, and Sao Paulois including the Federal District of Brasilia. The institutions were mainly environmental agencies, federal universities, state or federally-owned enterprises, research and scientific financing agencies, schools, research centers, and alternative initiatives. The report is organized in seven chapters containing a description of activities developed by the organizations including illustrative schemes and drawings, statistical data and concluding remarks. (Author/MDH)

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Environmental education and training in Brazil

by Ricardo Braun

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Environmental education and training in Brazil

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Introduction

Environmental protection in Brazil is a source of mounting world-wide concern. It is a complex issue, involving the preservation of unique ecosystems not only in Amazonia but also in representative areas around the country. This includes native Indian tribes whose homes are often located in these areas and the global warming trend which results in part from the reduction in the world's forest.

Brazil, as a developing country, has experienced rapid industrialisation, urban centre expansion, and unplanned use of natural resources which have degraded the environment. This has brought public criticism not only in Brazil but also abroad.

In its National Development plan (1986-1989), the Brazilian Government declared the environment vitally important. Guide-lines were set forth for the First National Plan for the Environment. A National Policy for the environment was created, but has not been put into practice. Most environmental agencies were only created in the past decade and are just beginning to develop the strategy and political backing necessary to implement an effective policy.

The promulgation of the new Constitution in October 1988 and the National Environment Policy (PNMA) in 1981 brought into effect some of the world's most advanced environmental protection legislation. However, in the face of economic difficulties and multiple political and institutional changes, effective enforcement of environmental regulations is not yet satisfactory.

Training of professionals to work in environmental affairs in Brazil is recent. The environmental training process began in the 1980's, after the government established the above mentioned Policy. This policy limited the use of environmental resources and created a series of laws, norms and regulations on air, water and soil pollution control, preservation of environmentally sensitive areas and environmental management. This procedure created a dual demand in the new environmental labour market. The first was from state organisations that have to co-ordinate and execute state environmental legislation. The second was from the private firms and enterprises that have to adapt their production process to more stringent norms.

The great demand for specialised professionals in the environmental field caused some difficulty in designing a new environmental education and training system in the country. Previously, training activities were all structured for specific areas and problems. Today environmental training is multidisciplinary including, for instance, engineering, economics, sociology, anthropology, geology, geography, biology, technology and other areas.

At the inception of the environmental education process in the country, there was a need to develop a strategy to re-orientate the existing education and research system towards environmental issues. This is currently being done by creating multidisciplinary environmental consciousness in primary and secondary schools, including technical schools, universities and research institutions.

This process is being sponsored by the Government with universities and international organisations such as the United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP).

The main results of this co-operation have been the following:

- *development of an epistemology regarding the main environmental problems in Brazil;*
- *creation of environmental (multidisciplinary) centres in universities and research centres in Brazil;*
- *development of professional environment control training centres;*
- *development of a critical environmental group of professionals with master and doctorate degrees in universities and government agencies.*

For this study, lack of time has made it impossible to survey more than the most economically developed States in Brazil. However, it includes some very important environmental education and training experiences in the Amazonian region, which involve several less developed states in the country.

The Brazilian states surveyed were Minas Gerais, Parana, Rio de Janeiro, Rio Grande do Sul and Sao Paulo including the Federal District of Brasilia, in which several visits were made to institutions dealing directly (or indirectly) with environmental concerns. These were mainly environmental agencies, federal universities, state or federally-owned enterprises, research and scientific financing agencies, schools, research centres and alternative initiatives such as non-governmental organisations (NGO's) and private enterprises.

A general description of the activities developed by the above mentioned institutions including statistical data, constraints in developing environmental education and training activities and concluding remarks are stated in the coming chapters of this report.

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The views and opinions expressed in this document as well as any misinterpretations or errors, are solely the responsibility of the author.

Abstract

Brazilian environmental education and training experience is recent but has a concrete base of not only generating awareness amongst all levels of the population but also aims to train people to protect, control and manage the use of environmental resources.

Several visits were made to organisations, enterprises and institutions from the Federal, state and municipal governments, directly and indirectly, involved with environmental affairs. Contacts were also made with non governmental organisations-NGO's and private environmental initiatives to analyse and complare alternative paths in the Brazilian environmental education and training process.

This study is organised in seven chapters containing a description of activities developed by the above mentioned organisations including illustrative schemes and drawings, statistical data and concluding remarks.

I. Environmental education and training at the federal level

This chapter describes environmental education and training activities developed by some organisations working at the federal level. These are mainly the Brazilian Institute for Natural Resources and the Environment (IBAMA), the former Federal Environment Agency (SEMA), the Ministry of Education (MEC) and some of the National Environment Council (CONAMA) resolutions.

Environmental education in municipal schools is also mentioned in this chapter for a better understanding of the federal, state and municipal levels in the Brazilian education system.

The evolution of environmental resources management in Brazil led to the introduction of the National Environment Policy (PNMA), through which the National Environmental System (SISNIMA) was created. This system comprises the following authorities and institutions:

- Highest authority: The National Environment Council (CONAMA), responsible for assisting the President in the formulation of guidelines for PNMA.
- Central authority: The Brazilian Institute for Environment and Renewable Natural Resources (IBAMA), which is in charge of promoting, controlling and evaluating the introduction of the PNMA.
- Sectoral organisations: Organisations or institutions directly or indirectly connected to the Federal Public Administration as well as foundations instituted by public law associated with the preservation of environmental quality.
- Sectional organisations: State organisations or institutions in charge of carrying out programmes and projects to control the environment. They are also in charge of developing monitoring activities and formulating State regulations to maintain environmental quality.
- Local organisations: Municipal entities responsible for controlling the environment.

Five years after the National Environment Policy had been implemented, a review of the constraints in developing environmental education programmes was possible. These were mainly the low priority afforded by the government to this sector, lack of coverage of environmental education in the national development process and lack of definition by the government regarding the conception, implementation, co-ordination and evaluation of environmental education projects.

Until 1985 environmental education was not considered a priority by the government because it was recognised as a confusing diverse process. In some cases environmental education was known as ecology, mainly at the primary and secondary school levels. In other cases it was known as social communication, training or even community development. This made it difficult to analyse and evaluate any existing concrete results in the country.

A. CONAMA's resolutions

CONAMA has drafted some Resolutions to strengthen the National Environmental Policy and in 1983 the first Resolution on Environmental Education came into force covering the following points:

- identification of opportunities to train technical staff from environmental organisations;
- promotion of national programmes and projects on environmental education;
- promoting training events for exchange of experience and know-how between State authorities and institutions.

The Resolution also stated that State environmental authorities and institutions should consider the following points:

- developing environmental education projects;
- developing environmental training policies;
- participating in national environmental education plans and projects;
- developing surveys to identify training needs for the technical staff of environmental entities;
- giving technical support to local - municipal - organs.

The SILENCE programme

In 1990 CONAMA passed Resolution No. 02 implementing the Silence Programme which seeks to educate and train the population in noise pollution control. This was done by developing several technical courses on the subject.

In order to promote the programme several points were established. The first was to develop training courses in all State environmental organizations including certain relevant municipalities; second, to disseminate information through all manner of means of communication; third, to incorporate noise pollution in all secondary schools through a national education programme; fourth, to stimulate the industrial sector to produce machines, motors and equipment with less noise and vibrations; fifth, to develop conventions and contracts with various organizations and training institutions to execute the Programme throughout the country and, last but not least, to stimulate training programmes within the armed forces.

B. Brazilian Institute for the Environment and Natural Resources-IBAMA

The Brazilian Institute for the Environment and Natural Renewable Resources-IBAMA was created in 1990 to execute the environmental policy established by Law No. 8.028. It is a recent fusion of four former organizations: the Brazilian Institute for Forestry-IBDF, the Fishery Development Organization SUDEPE, the federal environment Agency-SEMA and the Rubber Tappers Association.

IBAMA is currently undergoing a reorganisation to establish functional divisions compatible with it's new structure, policy and power.

Courses developed by IBAMA

IBAMA has concentrated efforts in executing a training policy not only for the organization but also to strengthen the less technically capable State Environment Organization in the country. See Annex 1(a) for details of courses carried out by IBAMA.

External training activities

IBAMA has created a Human Resource Development Division - DIDER, responsible for formulating training policies for the institution. It is also responsible for identifying and structuring training activities on the preservation, conservation, control and taxation of environmental resources.

DIDER provided 71 public courses directly (or indirectly) related to environmental topics in the period from January to August 1990. These courses were offered by both national and international private organizations.

IBAMA has 28 employees participating in post-graduate (master and doctorate) courses of which 13 are studying at national universities and 15 at universities abroad in Canada, Germany, Japan and the United Kingdom.

Training perspectives

DIDER is planning to train around 1.200 people in the next three years, through 29 courses and nine seminars.

The identification of training needs has been carried out by a systematic survey throughout IBAMA's divisions. This survey helped establish priorities for certain environmental subjects mentioned in Section (b) of Annex 1.

Environmental education affairs

IBAMA has an Environmental Education Division-DIED that is developing a number of activities such as training technicians in environmental management, supporting environmental education programmes in the formal teaching system, supporting environmental education schemes with local communities, developing environmental education activities regarding the PNMA and Indian communities-PMACI.

IBAMA believes that environmental education is not an isolated process and should be established as a non-formal option in public schools. It also considers the establishment of environmental education as a necessary multidisciplinary subject adapted to the local Brazilian situation. The main idea is to transfer the positive experience gained in developed regions to less developed Brazilian regions, since they normally have less access to communication and other facilities (eg. from the southern part of the country to the Amazon region).

Training developed (or supported by) DIED

- Specialisation Course on Environmental Education developed at the Federal University of Mato Grosso - UFMT
  The course is described in Chapter VI of this report.
- Training Course on Environmental Education
  This course was specifically designed for IBAMA's technical staff. It was structured for a multidisciplinary team of participants such as biologists, engineers, veterinary surgeons, sociologists, psychologists and other areas. Thirty five participants attended the course, nine from IBAMA's headquarters in Brasilia and the rest from each of the 27 State agencies IBAMA has in Brazil. The duration of the course was 80 hours/class, with the main objective of providing participants with environmental education techniques to be applied in future environmental projects designed by IBAMA.
- 2nd Course on Environmental Education and Training
  This course was exclusively designed for IBAMA's staff
- First Training Course on Environmental Education for NGO's

- 5th Specialisation Course on Environmental Education

Training constraints

Regarding environmental training as a whole the lack of financial resources has affected the implementation of most of the training activities planned by IBAMA for the future. For instance the courses planned to be developed in 1991 represent only one fifth of all training activities initially proposed by the institution.

Difficulties identified regarding the implementation of environmental education programmes are mainly lack of integration between the formal education system and the new environmental education process. This happens mostly at the college and primary and secondary schools levels.

Environmental education, training and research at the ecological stations

Before IBAMA was created in 1990, the central authority for SISNAMA was the Federal Environment Agency - SEMA which had developed several environmental education and training activities covering three basic points:

- Technical training: to train high level technicians to participate in environmental activities developed by SISNAMA organizations.
- Formal education: to implement environmental subjects into school curricula.
- Community education: to implement environmental information action and stimulate local community participation in environmental protection.

The ecological stations programme was created to protect representative natural environments in Brazil. These stations have infrastructures for accommodation and laboratory research for national and international university students and scientists.

The stations are permanently preserved and protected in order for students and researchers to make comparative ecological-social studies between the protected ecosystems and surrounding, normally non-protected areas. They are also used as training laboratories for graduate students.

In 1982 an environmental education programme was launched by SEMA and the Brazilian Teaching Movement to Read and Write-MOBRAL, sponsored by the Ministry of Education-MEC. This programme was located beside some representative ecological stations in the Amazon region. The main objective of the programme was to create conditions for effective participation of local communities in the preservation and conservation of the environment.

The training materials used in this project were mainly folders, posters, audio-visual and films that 2 technicians from SEMA and 11 from MOBRAL used on the project.

The project formed groups of people to co-ordinate other groups in environmental community activities . The groups were trained to work with "environmental perception" techniques in order to plan and orientate practical action in the field.

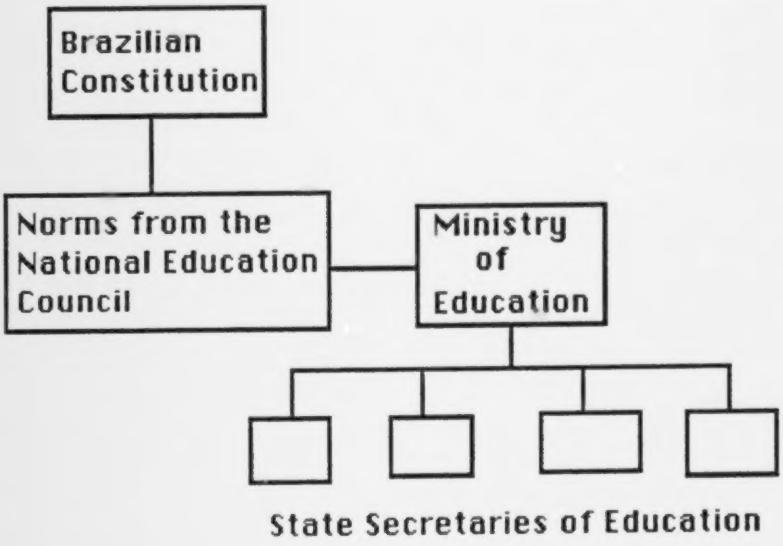
It was also planned to transfer the experience from the project to other representative ecological stations.

Ministry of Education-MEC

The new Brazilian Constitution[1] mentions new directives for the education system. This has directly influenced the Ministry of Education - MEC, which co-ordinates implemention of the National Education Policy.

MEC is supported by the National Education Council, which is in charge of developing norms and regulations for all levels of education in the country.

At state level, the education secretaries, based on the above mentioned policy, are the authorities responsible for implementing specific regulations for the state and municipal education system as seen below:


Brazilian Constitution
Norms from the National Education Council
Ministry of Education
State Secretaries of Education

Environmental education in Brazil began in the 1970's but in a very modest way. In 1979/80 the Ministry of Agriculture requested MEC to develop an environmental education programme for schools in the southern part of the country due to growing environmental problems (eg. soil erosion and desertification) caused by poor agricultural practices. After the request was made, MEC began to rethink the existing school curriculum in which ecology was the main environmental related subject. The process of implementing environmental education as a multidisciplinary subject in schools had begun, but still took some time to become what is now officially established by the government.

What MEC considers as environmental education

It is educational action designed to enhance understanding of ecosystem dynamics, considering the effects (or consequences) of the relationship between human beings and nature.

MEC's basic aim is on the one hand, to prepare people at all levels of education to interact harmoniously with the environment and on the other hand, to generate a critical view of their role in exploiting environmental resources.

MEC's efforts are also to ensure that teachers, students, technical and administrative sectors in schools are interacting efficiently about environmental education. Teachers should provide the students with a multidisciplinary view of the environment, integrating several subjects.

Last but not least, MEC seeks to form future citizens who are not only capable of living in harmony with the environment, but also of developing action to improve it. For this reason it has stimulated the development of programmes to enforce the relationship between schools and the community in practical action such as tree planting, waste recycling, and other environmental activities.

Constraints in the environmental education process

Although MEC has several objectives regarding the development of general educational programmes in the country there have been some critical bottlenecks that should be considered. For instance, in the 60 years of MEC's existence there have been 59 ministers, who almost always had new plans and programmes for the Brazilian education system. This has also happened at the state and municipal levels due to constant changes in the government.

The other point has been a refrain of many educational programmes which have suffered from lack of financial resources due to the economic difficulties faced by the government in recent years. Many good educational programmes have been halted due to other priorities established by the government.

The implementation of MEC's environmental education strategies at the state and municipal levels has to be done smoothly and gradually otherwise there is normally a rejection from education secretaries on ministry's "packages".

MEC's aims for the next years

MEC's basic aims for environmental education are the following:

- reach all primary and secondary school students by 1994
- support and stimulate research on environmental education methodologies
- support the development of post-graduate courses on environmental education

Our nature programme

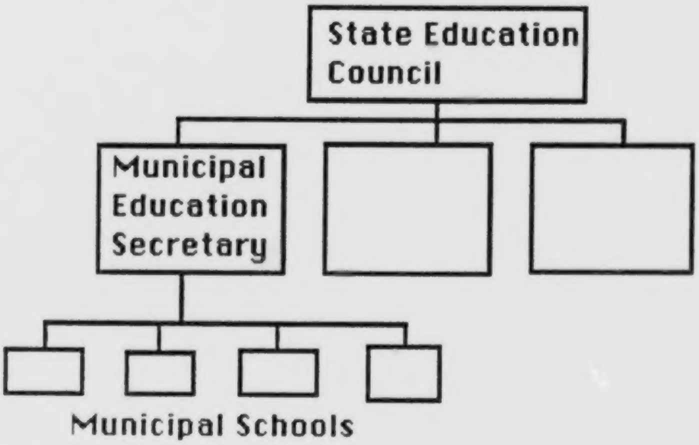
This programme is proposed for the Amazon region involving 11 states: Amapá, Acre, Amazonas, Maranhao, Mato Grosso, Mato Grosso do Sul, Pará, Rondonia, Roraima and Tocantins. It was designed to last 12 years, which corresponds to the time taken for a student to begin in the primary school and end at a university.

The programme is headed by MEC and is supported by several other organizations such as the Brazilian Institute for Natural Resources and Environment-IBAMA, National Television Foundation-FUNTEVE and the Brazilian Radio Network-RADIOBRAS.

The main thrust of the project is to focus on solutions to environmental and social problems in the Amazon. The programme was subdivided in 7 sub-projects: 1. forest cover, 2. mining, 3. legislation, 4. environmental education, 5. infrastructure, 6. indigenous groups and 7. local population. These sub-programmes will be developed at the primary and secondary school levels as well as at universities by supporting the development of post-graduate courses in environmental education.

Environmental education at the municipal level

The Ministry of Education is responsible for establishing the (general) minimum curriculum for municipal and private schools. The State Education Council then elaborates an adapted version, according to the social and economic situation of the state. However, at the municipal level, education secretaries have two options. They may develop a scholarship curriculum for municipal schools, based on that developed by the state secretary or simply implement the state curriculum with no changes. The institutional framework for the educational system is seen below:



Municipal education secretary of Petrópolis

The Municipal Education Secretary of Petrópolis (a town located 50 km from Rio de Janeiro with around 80,000 inhabitants), implemented Law no. 4.258 in 1984 establishing ecology as an obligatory subject in the 5th and 7th grades of the municipal school network. The schools are give one class a week corresponding to 72 hours per year, for both urban and rural schools.

Besides ecology classes the schools not only promote special events during the environment week (specially on the 5th of June: International Environment Day), but also the whole year long. For instance some of the environmental events developed by schools are tree planting activites on the Tree Day, development of a medicinal plant project, a waste recycling project, science fair, celebration of the Indian day, organic fertilizers for plants and other events.

There are also specially developed programmes for the rural areas such as setting up vegetable gardens with the participation and help from farmers and parents.

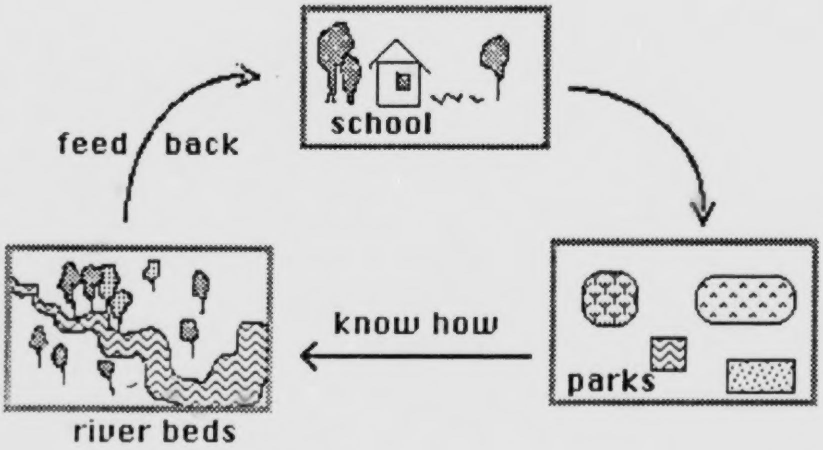
Transference of practical ideas from one school to another has been developed through student visits and the participation of school teachers in training events to learn new environmental techniques (eg. application of natural fertilizers in school gardens).

Case study from Paraná State

The government of Paraná decided to become an ecological state. For this and other reasons a very interesting environmental education project was developed in some municipal primary and secondary schools.

The project was developed in three stages. In the first the students developed several vegetable gardens and landscape design projects inside and around the school area with the help of the science teachers.

The second stage consisted in developing these gardens into public parks. Based on the experience gained in the second stage, the students were able to develop reforestation and landscape gardening of degradated river bed areas, as seen in the scheme below:



Municipal council of Arraial do Cabo

The representative of the Brazilian Green Party-PV from the Municipal Council of Arraial do Cabo (a small town also located in the State of Rio de Janeiro), developed Law number 056-90 of 19/04/90, implementing the inclusion of environmental education in all municipal schools.

The law established that the municipal school network should implement environmental education into all environmentally related subjects such as geography, health, science and others.

The Law has not yet been implemented due to lack of human and financial resources and materials (eg. special books, folders, posters and other materials) on environmental education. But some schools such as the Primary Integral Teaching Centre-CIEP have been improvising environmental education activities in science classes and out-door environmental activities.

Case study from Rio Grande do Sul State

As of April 1991 several municipal school students from Porto Alegre city (capital of the State), started to learn how to develop biological vegetable gardens, raise domestic animals with natural food and separate domestic waste for compost and materials recycling for industry.

The project was organised by the Environment State Secretariat-SMAM especially for primary school students. It also includes ecological walks and participation in conferences on air, water and soil pollution in the state.

C. Conclusions

- Environmental education in Brazil is quite recent. Until 1985 it was not a priority because it was considered too diverse and confusing. The new Brazilian Constitution of 1988 stated that "environmental education should be promoted in all levels of education and public awareness in order to preserve the environment". Today the picture is different, several environmental education programmes and projects have been developed by the federal, state and municipal governments, including activities implemented by NGO's.
- CONAMA has implemented resolutions for developing environmental education and training activities for SISNAMA such as the Silence programme on noise pollution control which established training courses for all state environmental organizations including the armed forces.
- IBAMA is a recent fusion of four former governmental organizations: SEMA, IBDF, SUDEPE and the Rubber Tappers Association, therefore it is still in the process of planning, administrating and organizing it's new structure.
- IBAMA has created an environmental education division which has developed several training courses to train and inform people about environmental education methodologies and techniques. As an exception to Brazilian governmental decisions, it has continued to carry out training programmes formerly developed by SEMA.
- According to IBAMA, the main difficulty in setting up environmental education schemes in schools has been a lack of integration between the formal education system and the new environmental education process.
- MEC affirms that the environmental education process in Brazil began in the last decade and is now being implemented at all levels of education. Environmental education in schools represents the initial steps in awakening children's consciousness to environmental issues and generating interest for future occupations. The environmental education process has been working best with students from 6 to 12 years old. After that they are normally more interested in other things and less in the school.
- Another critical point has been a lack of financial resources to carry on several environmental education

programmes, but once they have financial support the next step has been normally to convince the education secretaries and councils to introduce these programmes at the state level. There have been rejections from the states which consider the training "packages" unsuitable for their particular situation.

- Although there have been major constraints, as mentioned above, in developing environmental education activities in the country, they have not restrained MEC from setting basic aims for the future. These aims mainly provide environmental education for all primary and secondary schools in the country by 1994, doing research into new environmental education methodologies and developing post-graduate courses on the subject.

- Many municipal schools have been implementing several environmental education events and creating innovative solutions to overcome low financial support from the government. For instance by developing practical environmental out-door classes, transfering practical ideas from one school to another in the same municipality, using practical knowledge from rural people such as farmers to develop vegetable gardens with natural fertilizers and even developing reforestation of degraded river bank areas.

II. State environmental secretariats and organisations

Every state in Brazil has an environmental organisation, institution or co-ordinating body in charge of carrying out programmes and projects to control the environment. They are also in charge of developing monitoring activities and formulating state regulations in order to maintain the quality of the environment.

This chapter describes the environmental education and training innovations in several state environmental secretariats and organizations namely, the State Environment Secretariat-SMA and the Company for Technological Development and Pollution Control-CETESB of Sao Paulo, the State Environmental Engineering Foundation-FEEMA, the State Forest Institute Foundation-IEF, the Foundation for Public parks and Gardens and the Forest Police of Rio de Janeiro, the Secretariat for Urban Development and the Environment-SEDU and the Superintendence of Water Resources and the Environment-SUREHMA of Paraná, the State Environment Secretariat-SMMA and the State Environment Foundation-FEAM of Minas Gerais, the State Environment Protection Foundation-FEPAM of Rio Grande do Sul and the Environmental Science and Technology Secretariat-SEMANTEC of Brasília.

A. State Environment Secretariat - SMA of Sao Paulo State

A population of 21 million inhabitants is forecast for greater Sao Paulo by the year 2000. The capital is currently 5th in the world in terms of population. Sao Paulo produces around 50 per cent of Brazil's gross domestic product-GDP. The state has around 100,000 factories, half of them located in greater Sao Paulo. It has 23 industrial complexes alone amounting to 110 plants.

Most of the Atlantic rain forest is also located in the State of Sao Paulo along the "Serra do Mar" Mountain Range, a stretch that reaches 400 km. The estuary on the southern coast is a very rich region to be preserved mainly because of the mangrove areas. SMA was founded in 1986 and fully restructured in March 1987. It has a staff of 5,000 employees of which 60 per cent are based in the capital.

The secretariat is has four departments, namely:

- Preservation of parks and natural areas
- environmental education
- environmental planning
- environmental research and computer information

The basic aims of SMA are to recover and protect 12.500 km2 of original forest, 400 km of coastline, 1.3 million hectares of officially preserved areas; to maintain 84 public preservation units and to control pollution in rivers and lakes, urban air pollution, urban noise impact and garbage problems in the state.

The secretary is now developing the following activities:

- final stage of controlling pollution in Cubatao
- transfer of dwellers on the dangerous slopes of "Serra do Mar" Mountain Range
- air borne seeding of affected slopes of "Serra do Mar"
- the refinement of impact studies analysis and evaluation
- orientation of final disposal of industrial garbage
- norms and control of vehicle pollution
- creating Campinas city new ecological park and eco-museum

Environmental education activities

The following activities are being developed by the environmental education department-CEAM.

Inter-institutional Commission on Environmental and University Education-CIMAEU

The basic aim of CIMAEU is to integrate most teaching institutions and universities in Sao Paulo in order to introduce environmental concerns into their policies.

The basic attributes of the Commission are:

- To analyse and study the relationship between the environmental question and the university education system.
- To develop the first steps in creating associations and scientific entities to work and link environmental education into university education.

Environmental education forum

The Forum was developed in 1989 with several organizations directly and indirectly related to the environment in order to discuss the role of environmental education in the state of Sao Paulo.

There were 370 participants ranging from NGO's to university students, including students and professors of several teaching institutions in which 32 papers were presented on the following topics:

- Environmental education in natural protected areas to generate environmental consciousness.
- Global co-operation in the class room for a better world.
- Course for school teachers : Analysis of the environmental conditions in the eastern part of Sao Paulo state, with a river basin as a reference.
- Environmental education based on student perception and teacher's orientation.

Environmental education programme for primary and secondary school teachers

This programme was developed in two areas. The first was called "Vale do Ribeira", an industrial region in Sao Paulo, in which practical information on environmental education was provided for municipal school teachers.

The second was a series of environmental courses given at a well known tourist island named "Ilha do Cardoso", mainly due to existing environmental degradation problems.

Environmental education in the conservation units

This programme was developed at some of the most representative conservation areas of Sao Paulo such as ecological stations, natural parks and protection areas. The basic aim of the programme was to provide visitors to these areas with environmental information.

Science train station

This project was developed with support from the University of Sao Paulo-USP and National Scientific and Technological Council-CNPq.

The physical infrastructure of the project is an old recovered train station. It was designed to provide all sorts of environmental entertainment such as games, small models, simulation structures for school children to have direct contact with environmental activities.

The station also has a small theatre with three environmental plays: "wastes", "animals" and "good and bad technologies".

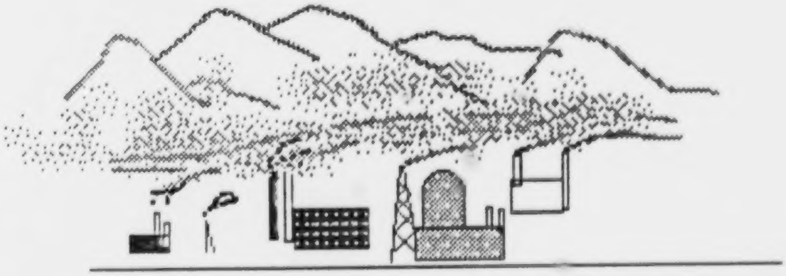
The station receives around 1,000 students per day, and in 1990 around 100,000 people (students and the general public) visited it.

Environmental toys

This project was formulated to stimulate toy factories to develop environmentally friendly, educational toys for children ranging from 4 to 8 years old. When a toy is created the factory has to submit it for an official approval tag provided by SMA . If the toy is not approved it cannot be sold as an environmental toy.

Cubatao project

Cubatao is a small town located in an industrial area in the coastal area of Sao Paulo. It has severe problems such as unemployment, lack of housing, basic sanitation including water, air and soil pollution. . It was known in the past as death valley because of it's high pollution rates.



But after many enviromental campaigns developed by the government of Sao Paulo, the pollution rates have decreased considerably.

This project was launched in 1983 to organize local community groups to work on environmental activities against pollution in Cubatao.

The project gathered not only the locals but also trade unions, the church and women's groups which participated in the process of disseminating special environmental education folders.

They also discussed the role of the community as being environmental "watch dogs", to tax and denounce environmental problems in the region.

The day the city of Sao Paulo STOPPED !

In 1988 a campaign to reduce the air pollution in the city of Sao Paulo was launched with the basic aim of halting the circulation of cars (estimated at 250 thousand per day) for a whole day on an estimated date.

The idea was born because of the severe air pollution rates in the city (one of the highest in the world) , due to car circulation and industrial pollution.

The campaign began six months before the established date. During this period a massive environmental education process was developed with the population, estimated at 17 million inhabitants. All means of communication were used in the process, including the development of several environmental events such as seminars, exhibitions, lectures and fairs.

The campaign was considered successful not only because on the designated day only around 250 (one per cent) cars were seen circulating in the city , but also because the air pollution rates decreased dramatically.

Seminar on environmental impact assessment-EIA in South America

This event was organized by SMA-co-ordination of environmental planning in order to discuss general aspects about EIA in several south American countries: Argentina.Bolivia. Brazil. Chile. Colombia. Ecuador. Guyana. French Guyana, Paraguay, Peru, Surinam, Uruguay and Venezuela. The event also included people representing NGO's, consultant firms, international agencies and environmental technicians/specialists.

The objectives of the seminar were to:

- stimulate the development of environmental impact Studies-EIS in South American countries
- establish common thinking and norms of EIA and EIS practice in South America
- create a regional association of EIA professionals
- establish integrated environmental planning policies

B. Company for technological development and pollution control-CETESB

CETESB was created in 1968 and is currently a centre of environment technology and sanitation not only working for the State of Sao Paulo but also for many other Brazilian states as well as other Latin American countries.

It has 2.307 employees with either university or medium (technician) level degrees.

The activities developed by CETESB contribute to improving the quality of life of around 30 million inhabitants in Sao Paulo.

The company has a Training and Technology Transfer Division in charge of organizing, promoting and co-ordinating environmental courses and events such as seminars, lectures, workshops, conferences, fairs and exhibitions. These events are developed both for it's internal staff and external organizations such as other Brazilian state environmental agencies, governmental authorities and institutions, private enterprises, industry, engineering firms, schools and universities.

Training statistics

In terms of training activities, CETESB has the best system in the country. From 1987 to 1989, *18,000 people were trained in a wide variety of* courses. These courses are normally divided in two types. The first are open courses for several clients (eg. industries, environmental organizations, universities and others). The second are closed courses with specific content, specially designed for enterprises.

The open courses are sub-divided into four *specific sectors: water, air, soil and special* areas.

The table below shows the number of courses developed from 1987 to 1990 in each of the above mentioned sectors.

Year	Water	Air	Soil	Special Courses	Total
1987	357	161	54	230	802
1988	406	183	93	466	1,148
1989	559	203	673	47	1,176
1990	613	77	65	316	1,071
Total	1935	624	279	1,359	4,197

Around 25 per cent of the courses organised by CETESB are for industry. The number of people from the industrial sector trained by the company in the period from 1987 to 1990 was 1,145.

The clients trained by CETESB from 1987 to 1990 are the following:

• industry	1,145
• engineering firms	95
• public organisations:	
sanitation firms	341
environment agencies	158
municipalities	253
others	370
• research study institutions	275
• international organisations	45
• others	2,826
• CETESB	1,371

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Distance training

The company also has a long distance training programme in the following areas:

- Water quality recuperation
- Sewer collection and transportation system
- Installation of sewer pumping system
- Ecology and Environmental Impact Assessment-EIA

This programme began in 1987 and has trained 730 people in Brazil. There have also been seven participants from other Latin American countries.

Training events in 1990

In 1990 CETESB initiated a computerized information system to provide around 8,800 people with environmental information. It also continued developing a programme called the Youth Programme at the Centre for Work Initiation-CIT. This centre has already trained 90 students who are now working in several of CETESB's divisions. Another 30 students are now being trained by the centre.

In 1990 the company undertook 1,654 audio-visual schemes and environmental visual programmes and developed 754 training activities on technology transfer for 57,757 people. These activities were mainly courses, workshops, seminars, conferences, lecturesr and exhibitions.

The participants are from private enterprise, public organizations, NGO's (non governmental organizations), universities and media associations.

The table below gives a general idea of all training activities undertaken:

Courses	**No. of Activities**	**Participants**
Open	51	1,071
Closed	33	691
Specialised Practical Training		
Open	13	49
Closed	33	50
Distance Training Seminars, Workshops, Lectures	23	3,615
Environmental Exhibitions in Schools	43	16,614
Environmental Fairs	10	30,480
Student Visits		
Individual Assistance	483	483
Schools	38	958
TOTAL	731	54,142

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Recycling courses

Many courses offered by CETESB are repeated every year because of the great number of people waiting to be trained in specific topics. For instance, the most popular courses are water treatment and pollution control and other courses such as industrial ventilation and economic engineering are given twice a year due to the high demand.

CETESB's philosophy is to update previous training courses providing additional information and improving training methods. The updated courses are normally adapted to requests from and the needs of clients of the company (eg. industries and engineering firms). CETESB also develops evaluation reports for each course given, whilst providing the means for improving the company's training services.

Duration of training courses

The training courses and special practical training-TPE offered by CETESB range from 20 to 80 hours/class. The relation between the duration of the activity and the level of the course is given below:

Level of Training	**Duration**						
Course	**20h**	**24h**	**32h**	**36h**	**40h**	**80h**	**Total**
University	3	8	7	-	19	3	40
Medium	-	2	4	1	11	3	21

A list of training courses is given in Annex 2

Environmental chart

The environmental chart of Cubatao and surrounding areas was finalized in 1985. The project was executed by CETESB with financial support from the Department of Water and Electric Energy-DAEE, the International Maritime Organization-IMO and the Pan-American Health Organization-PAHO. The methodology utilized to develop the chart was an adapted version developed by Professor André Journaux from the university of Caen, France.The project involved training activities and orientation provided by Professor Journaux.

Forty six people were trained by the project: 9 graduate students, 10 executors of the project, 2 technical co-ordinators, 2 supervisors, 14 technicians, 2 consultants and 7 administrative staff.

Environmental education activities developed by CETESB

The department of events of CETESB has developed the following environmental education activities as seen below:

- Lectures and conferences on sanitation, urban wastes, water supply and waste recycling for the local population in strategic municipalities in the state of Sao Paulo.
- Environmental education and training given at three basic levels: for children through local environmental events (eg. science fairs), for adults: (eg. environmental awareness activities) and university students.
- Environmental education for the coastal zone : This activity was developed to generate environmental awareness of the existing environmental problems in the coastal zone

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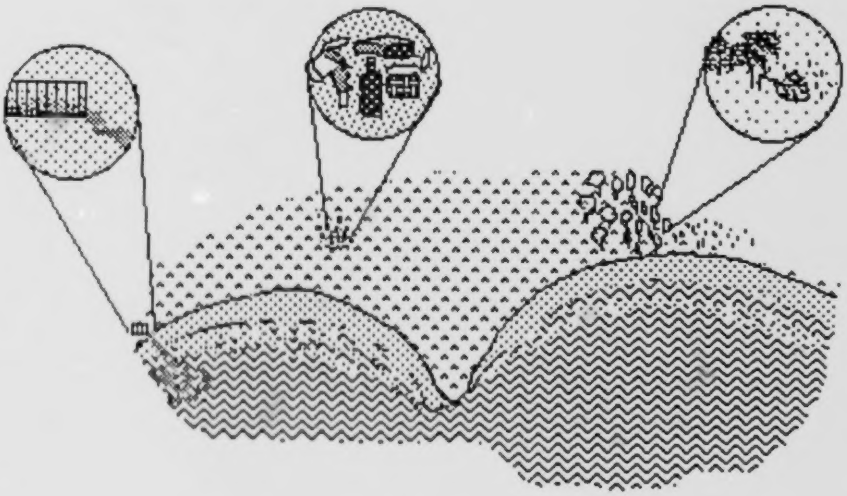
of Sao Paulo. Participants in the course are mainly from the municipal environmental councils-CODEMAS including the participation of local people.

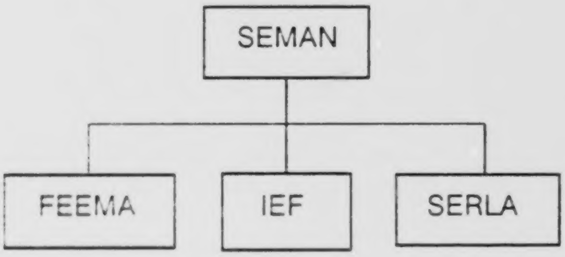


Project I: Environmental exhibitions in schools: The main objective of this project is to introduce environmental activities such as air, soil and water pollution control in primary and secondary schools. The exhibitions are set up with photographs, panels, video, lectures and distribution of folders and other written information.

The idea of taking the exhibition to schools was mainly because the majority of schools cannot cover the cost of taking students to CETESB headquarters located in Sao Paulo city.

C. State Environmental Engineering Foundation - FEEMA

The State Environmental Secretariat-SEMAN of Rio de Janeiro is composed of three organs: FEEMA, the State Forest Institute Foundation - IEF and the Secretariat for Rivers and Lakes-SERLA as seen in the scheme below:



SEMAN is responsible for co-ordinating and implementing state laws on the environment and norms with support from the above mentioned executive organizations.

FEEMA is an executive arm of the state environment policy authority which aims to control the environment, plan the utilization of natural resources and enhance social and economic development in harmony with the quality of life of the population.

In terms of environmental training, FEEMA has been developing various activities in the past five years. It is considered the second most structured environmental state organization in Brazil.

In 1990 there were 900 people trained through 30 courses and ten special training events such as conferences, seminars and meetings. FEEMA has also developed professional training activities specially organized for enterprises as well as the general public.

In general, participants in the training events consist mainly of university students, school pupils, medium level technicians, workers, employees from engineering firms and in some cases decision makers.

How are training courses identified?

FEEMA has an environmental education and training co-ordination unit which is in charge of identifying, structuring and organizing training events. The co-ordination also analyses feed-back given on previous courses and formulates new training strategies.

The identification of training needs is done previously by surveying each of the specialized divisions in the institution (eg. water pollution control, environmental impact assessment-EIA, air pollution control and others).

The information from the survey is normally analysed as to the following points: (1) the most important environmental problems that occur in Rio de Janeiro State, (2) training demand on specific topics, (3) number of participants in specific training courses and (4) feed-back information on professional performance of employees after training.

An example was a course given on environmental impact assessment - EIA for engineering firms in Rio de Janeiro. The basic objective of the course was to improve the development of environmental impact statements-EIS executed by these firms, with regard to the EIA State Legislation. This resulted in better EIS's being developed by the firms after the training course.

Each year FEEMA implements a new training programme adjusted to the training programme developed the year before. But although the number of courses is relatively high (around 30 each year) they are still not sufficient to meet demand or solve environmental problems in the State (eg. water pollution due to industrial activities and household wastes, air pollution due to industrial activities and car traffic, deforestation, soil erosion and degradation of water sources due to use of pesticides).

Training activities developed in 1990

FEEMA has been developing two types of training courses. The first was designed for medium (technician) level students including students without primary schooling in order to train workers for the environmental labour market. The second type was designed mainly for people with a university degree.

In 1990 FEEMA developed 22 courses, eight for the first group and 14 for the second group. See Annex 3 for details of the courses.

Environmental education events

FEEMA has been developing several environmental education events in which a large number of people have participated ranging from town mayors to local people. The most important events organised by FEEMA are the following:

- Fifth Municipal Conference on the Environment
- First Environmental Education meeting

- Seminar on Black Smoke and Human Health
- Meeting on the Participation of the State Municipalities in the Environmental Question
- First Seminar on FEEMA's Control, Disinfection and Rat Extermination Techniques for Specialised Firms
- First Environment State Conference
- Seminar on the Recuperation of the Environmental Quality of Paraiba do Sul River Basin
- Regional Meeting on Environmental Education and the project Environment Agents-AMA

Environmental agents

This project has the basic objective of training school teachers in 24 municipalities of Rio de Janeiro. The training activities range from conferences and seminars to ecological walks mainly in environmentally sensitive areas (eg. natural parks, protected forests and mangroves).

The environmental subjects treated are adapted proportionally to the particular problems existing in each municipality. For instance in the coastal areas they are oriented towards water pollution, beach degradation, degradation of sand dunes, illegal occupation of coastal areas and other topics. In the mountain region the subjects treated are mainly deforestation, soil erosion, waste disposal, household wastes and sanitation problems. The project has developed educational activities in more than 30 municipalities.

Seminar on the environmental question and the media

This seminar was developed specially for people working in the media such as in radio, television, newspapers and magazines. The main objective was to improve and correct the terminology and style of giving environmental news.

D. State Forest Institute Foundation - IEF

IEF is a very young organisation founded in 1989. It's basic aim is to defend fauna and flora resources and to recuperate forests in the State of Rio de Janeiro, now estimated at only nine per cent of the total existing area in the beginning of the century.

The following activities have been developed by IEF in the past two and half years:

- Training the military police and soldiers regarding conservation measures and forest supervision.
- Training school teachers in fauna and flora preservation.
- Integrating children in environmental events like planting trees, showing environmental films, giving talks, visiting reforestation areas and participating in ecological walks through natural parks.
- Giving talks about environment protection for rural communities.
- Developing brochures and other teaching materials for schools.
- Developing environmental education programmes beside protected areas.
- Teaching the local population how to plant trees in degraded areas.
- Developing the "S.O.S. Mata Atlantica" (Atlantic Forest) movement to protect and recuperate the degraded areas.

- Training university students from the Federal Rural University of Rio de Janeiro-UFRrJ in producing seeds for reforestation projects.

Planting trees in the "Favelas"

The "favelas" are slums located on the mountain tops and hillsides of Rio de Janeiro. Because of the low income and lack of living facilities such as water, sanitation measures and often electricity, in the past 40 years the population has cut down most of the forests for wood supply for cooking.

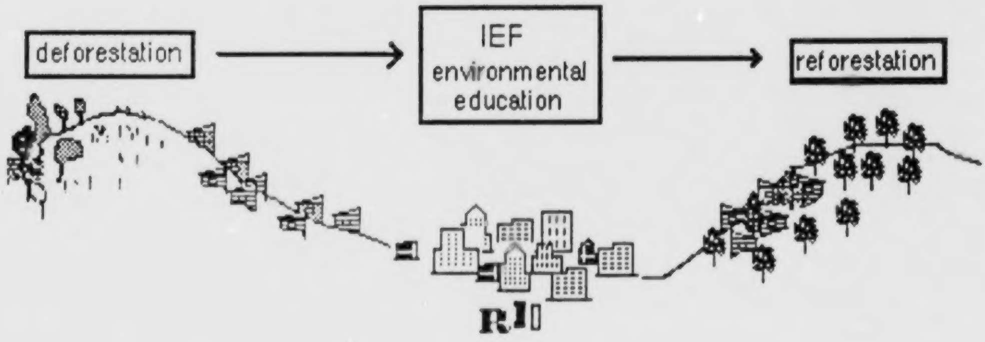
The very low cultural level of the people living in these areas due to various social problems has made it difficult to develop any recuperation project of existing eroded areas.

IEF has found an original way of developing reforestation and social improvement projects at the same time providing environmental education for the people living there.

Normally before developing any reforestation project in the "favelas", it is necessary to develop a social project previously in order to convince the inhabitants that they will benefit from it. First, there has to be an exchange of favours. In one specific case, the work was developed with the Social Care Organisation - LBA from the Federal government. They first gave powdered milk for the families and even constructed stairways up the hill in order for the "favelados" (people living in the favelas), to accept advice from IEF regarding reforestation activities.

This exchange of favours was highlighted by IEF as a typical "white man - Indian exchange system", (eg. first the white man gives a mirror or a whistle, then the Indians are opened up for a dialogue).

The reforestation programme in this particular "favela" in Rio de Janeiro worked well but in many cases if a social programme is not developed prior to starting a reforestation project, then the probability of success is very small.



The success of a reforestation programme normally depends very much on where the "favela" is located. For instance "favelas" located near the wealthy areas of Rio de Janeiro (eg. in Ipanema, Sao Conrado and Copacabana), have more chances for success because their inhabitants have more access to education and are more aware and open to new action by the government.

In a particular favela called "Vidigal", a reforestation project was launched with the local community in order to recover some degraded areas. The local population participated in environmental training events regarding the positive aspects of reforestation, care with native and fruit species and the benefit they could draw out of these trees.

The success of this project was such that not only was the local community able to harvest and sell fruits in the market, but also to have recuperated the degraded areas.

E. Foundation for public parks and gardens

The foundation is a public body linked to the town hall of Rio de Janeiro city. It is developing a programme to plant more than 110 thousand trees of native fruit and exotic species on the mountain tops and main hillsides of Rio.

The trees are being planted in order to minimise the risk of soil erosion whenever heavy rains fall, which may consequently negatively affect the population which has settled in the favelas.

The programme is linked to an environmental education campaign for local communities living around these areas.

Seeds and seedlings are distributed amongst the population by six technicians who provide technical orientation on how to plant and conserve the trees.

The programme has also recruited 120 local people to work in the reforestation activities which seek to recover 75 hectares in two years.

F. The forest police

The forest police is a recent branch of the military police of Rio de Janeiro created in order to supervise and monitor the state forests.

The police were trained by the forest battalion of Sao Paulo State which has 35 years experience in this field.

The group trained by the forest battalion later organised training courses for 280 soldiers who form the police. The main activities developed are:

- surveillance of irregular fishing and hunting
- controlling deforestation
- giving penalties to people commiting infractions against the Brazilian Forestry code.
- controlling potential negative environmental activities

Internal training schemes are also being developed regarding specific topics such as courses on snakes and other dangerous animals.

G. Secretariat for urban development and the environment - SEDU of Paraná State

SEDU is in charge of implementing and developing environmental activities in the State of Paraná. It has developed several environmental training events in the last four years with the Superintendence for Water Resources and the Environment - SUREHMA (directly subordinated to SEDU). One of the most successful training courses organised by the two bodies is described below:

First course on environmental management and administration

In 1987 the First course on environmental management and administration was launched with participants from several public (Federal, state and municipal) organisations. The positive feedback from this course stimulated SEDU to improve it's structure and develop second and third training courses in 1988 and 1989.

Because of the great success and positive repercussion in other states a fourth training course was developed with participation and support from the State Environment Organisations of Rio Grande do Sul - FEPAM, and Santa Catarina - FATMA.

Objectives of the course

The basic aim of the course is to train people working with environmental administration in methods of environmental analysis and evaluation of development projects.

The course also focuses on environmental implications of governmental development action such as urban and rural development, mining activities, and other projects that have a potential risk for the environment.

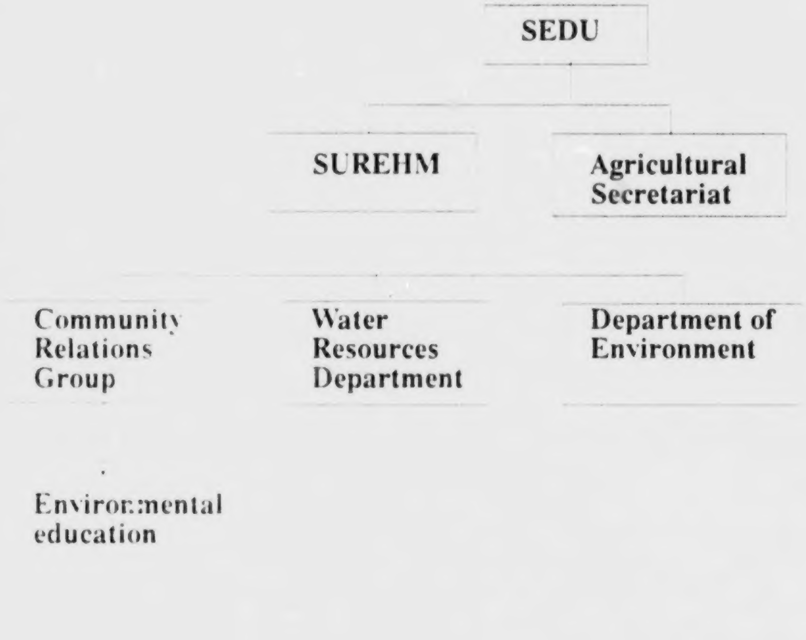
During the course there are several activities such as seminars, panels, technical visits and case study development in which participants take part.

The course was designed for a multidisciplinary group of 35 participants (eg. engineers, architects, biologists, agronomists, nurses, veterinary surgeons, oceanographers, sociologists, administrators, school counsellors, sociologists, librarians and other areas), divided into five groups (of seven participants each), to work during the course on the following topics: urban development, regional development, rural development, industrial development and eco-development.

H. Superintendence for Water Resources and the Environment - SUREHMA

SUREHMA is subordinated directly to SEDU and is formed into three basic divisions: the Department of Environment, the Water Resource Department and the Community Relations Group in which environmental education activities are co-ordinated.

The organisation of the body is as follows:


SEDU
SUREHM
Agricultural Secretariat
Community Relations Group
Water Resources Department
Department of Environment
Environmental education

State programme on environmental education

This programme was developed in order to unite all efforts in developing an integrated environmental education project with various State governmental bodies (eg. several governmental secretariats: agriculture, urban planning and others), directly or indirectly, working with the environment.

In other words, the programme was mainly developed to have a common environmental education programme for the whole State, in which all bodies would be working on different projects but for the same objectives.

Environmental courses

These courses are designed not only to train school teachers from municipal schools, but also to train people capable of training local communities.

The participants in these courses are in general NGOs and local technicians from municipal organisations. Other courses designed specially for children and teenagers regarding ecological conservation in urban and rural areas were also developed.

Environmental education campaigns

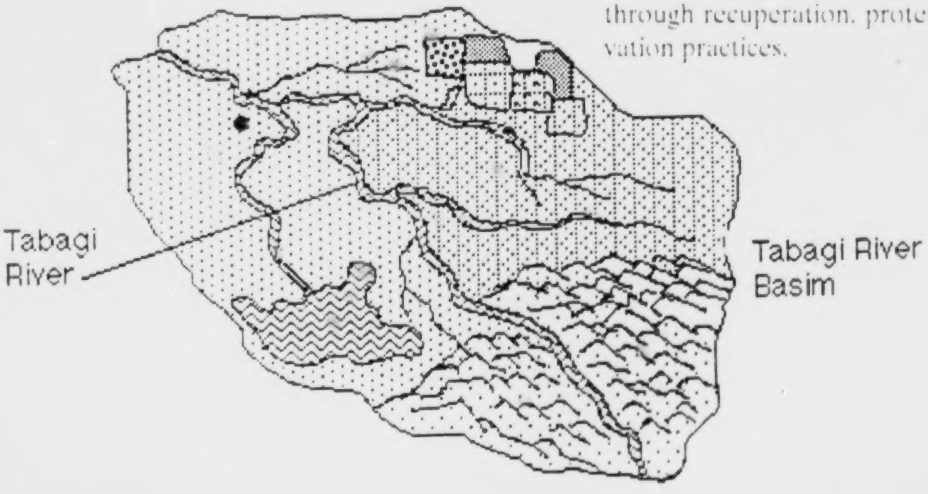
A campaign was developed in schools, community groups, television and newspapers seeking to:

- generate awareness amongst the population
- create ways for the population to relate themselves to environmental factors
- train people to train other people
- disseminate governmental environmental regulations
- elaborate educational materials about local and regional particularities

Inter-Municipal Action for Environmental Protection of the Tabagi River Basin - COPATI

The area of the basin is more than 24 thousand km2 with 41 municipalities and around 1,200,000 inhabitants. The basin has several environmental problems such as pollution by agrotoxics and wastes and water pollution by domestic effluents including industrial pollution.

The basic point of the programme is not only to solve environmental problems with technically orientated solutions but to re-orientate people's relationship with the environment through recuperation, protection and conservation practices.



The programme is a joint venture between several organisations directly or indirectly involved with the environment (eg. public organisations, superior teaching institutions, religious institutions and State and municipal organs).

Strategic action of the programme

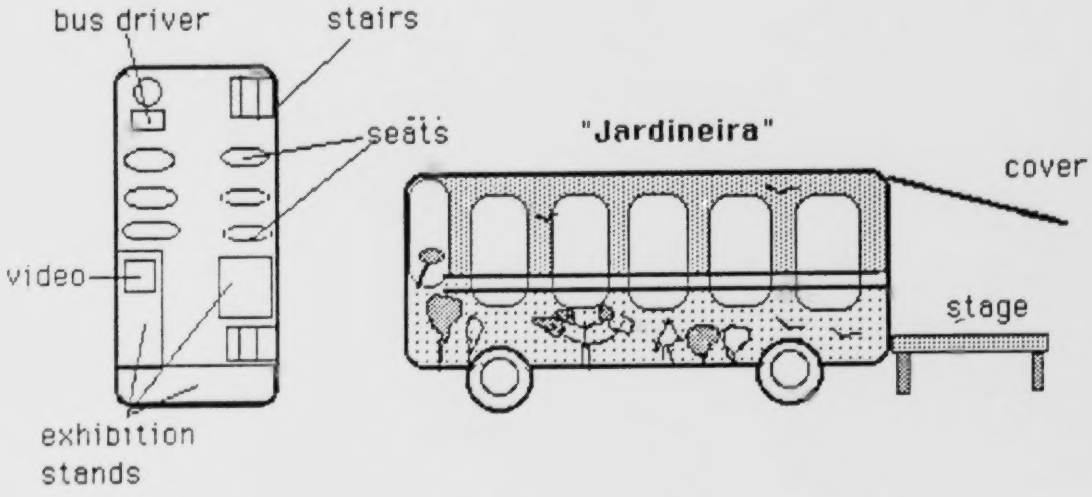
- Developing three community meetings of one day's duration each
- Developing six seminars on environmental awareness for 600 people of two days' duration each
- Developing several courses for school teachers of 24 hours/class, focusing on the following topics: introduction to COPATI, regional and local environmental problems formal and informal environmental education practical activities
- Discussion of proposals
- Environmental text contest for primary and secondary schools
- Talks on environmental issues

"A Jardineira" (The Garden ecological Bus)

This project is very similar to the one developed by SEMANTEC by the Federal District Government-GDF in Brasília (described later in this report).

The objective of the project is to circulate a bus (painted with ecological subjects such as the local pine tree - Araucaria, birds and animals), in all of the municipalities of TIBAGI river basin. This was mainly done to disseminate information on the environment, culture and folklore as well as events mainly in the rural area.

The bus is administered and maintained by a paper mill company and co-ordinated by two technicians from COPATI. The State Environment Education Group has trained several people to work in the activities developed by the bus. The scheme for the bus is seen below:



The bus acts as a circus arriving in a small town. The educational entertainment proposed by the bus normally stimulates almost everyone from the towns to participate in the activities. It travels mainly through rural areas in order to visit schools and provide them with environmental information on important geographical and ecological aspects of the basin.

The main activities developed are video and slides presentations, environmental exhibitions, musical shows with local artists, plays, presentation of folk groups, ecological competitions, talks and other events.

Environmental information courses

Environmental information courses are given at the Federal University of Paraná - UFPa in order to inform graduate students of environmental issues, on the following topics: solid waste management, forest management, EIA and EIS.

Environmental education courses for schools

These courses were structured for primary and secondary school teachers in order to involve them in environmental activities. SUREHMA organised visits to conservation areas, waste disposal sites and a bio-digestion plant. The basic idea of the course was to stimulate teachers to take their pupils to the field for environmental observation.

Environmental impact of dams

SUREHMA and the German Society for Technical Cooperation - GTZ have been organising short term training courses on the environmental impact of dams on the following topics:

- Risk analysis
- EIA of terrestrial environment
- EIA of icthyofauna
- EIA of social activities

I. State Environment Secretariat - SMMA of Minas Gerais

In July 1989 the department of Environmental Development of SMMA was created and subdivided in two divisions. The first is the project/study division and the second is the environmental education division, which has been developing activities mainly in the metropolitan area of Belo Horizonte (capital of the State), as seen below:

Training centre

SMMA has a plan to develop a training centre as part of an integrated programme co-ordinated by the State Education Secretariat and the Human Science and Philosophy Faculty - FAFICHE.

The main objective of the plan is to create an environmental training centre for municipal school teachers and students in general.

The centre will include all facilities (eg. library, classrooms, conference room, audio-visual equipment and others), specially designed for training events.

Seminars on environmental questions regarding the city of Belo Horizonte

The seminars focused on the following topics:

- tree planting
- green areas (parks, gardens and forests)
- waste collection and disposal
- Pampulha ecological reserve
- Serra do Curral environmental patrimony
- noise pollution
- school and environmental education

SEMAN also developed an integrated project in 1985 with parents, teachers and students from the municipal primary and secondary schools to plant trees in the metropolitan area of Belo Horizonte city.

"The other side of the environment"

This project was developed to integrate environmental topics into the working activities executed by public workers. In other words, the project gathered the people that carried out environmental jobs (eg. tree planting, gardening, park supervision and others), in the metropolitan area of Belo Horizonte, in order to explain the type of job that they were doing and the positive relation with the environment.

This training activity was developed because the workers did not realise how their work helped improve the environment.

The other point of the training programme was to stimulate the integration of environmental affairs in their daily lives, such as recycling household wastes, making compost, developing vegetable gardens, participating in environmental community groups, and other activities.

The project focused on lectures, informal seminars and social integration events for workers (e.g. barbecue). A total of 200 workers were trained in this project.

J. State Environment Foundation - FEAM

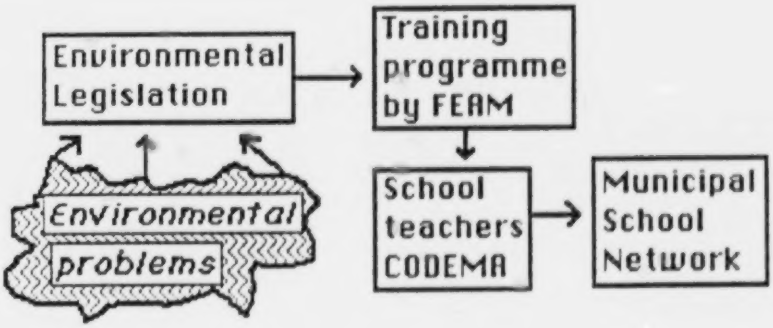
FEAM is subordinate to the State Environment Secretariat - SMMA and is responsible for executing environmental policy as well as disseminating environmental information through educational schemes for the public in general, private enterprises and governmental bodies.

The environmental training programmes developed by FEAM are executed at two levels. The first is at the formal school education level, in which environmental education is introduced as a multidisciplinary subject.

Events such as environmental competition amongst school children, conferences, talks, school research orientation, creation of an environmental library, video shows, seminars and courses and the distribution of brochures, posters, folders and papers have also been organised.

Another point of the programme is to train municipal school teachers including people connected directly with several municipal environmental councils - CODEMAS. The training activities focus mainly on the existing environmental problems and possible solutions to these problems.

As a result, the trained people have been acting as "multiplier agents" (teaching other people) in schools and through community participation. This training scheme is as follows:



The main subjects treated in the above training scheme are:

- The environment: concepts, components and classification
  duration: 1 hour
- Pollution: concepts, types, sources, causes and effects
  duration: 1 hour
- "The Great Pollutors" : 15 minutes video
- Multi-disciplinary environmental education: social studies, science, agriculture techniques, mathematics, artistic education, physical education and communication
- "Education Reality" : 15 minutes video

Up to 1990 eight environmental education projects had been developed as follows:

- Rural environmental education project and agricultureal/farm exhibition
- Environmental education at Jequitinhonha-Turmalina
- Environmental education at the ecological station of TripuÆ
- Environmental education for private enterprises
- Environmental education at Papagaio ecological station
- Environmental education at the Cachoeira das Andorinhas protection area
- Television education project
- Environmental education at Mantiqueira-Bocaina protected areas

The second level is the informal education process designed to generate awareness amongst municipal authorities regarding existing environmental problems in the environmental protection areas - APA implemented in the State.

At this level the following activities have been developed:

- seminars and public talks for approximately 100 people
- cultural activities such as open air theatre, rural environmental exhibition and ecological video competition
- Conferences given for the industrial sector

The Green Project

This project was created in 1989 (and was suspended in 1990 due to new government priorities), in order to stimulate public participation in helping preserve the environment, controlling polluting activities and recuperating environmentally degraded areas. The two last activities were supported and developed by private initiative.

The basic aim of the project was to expand the existing green areas in the State of Minas Gerais by planting trees, developing gardens, and other ecological activities such as environmental education schemes.

K. State Environment Protection Foundation - FEPAM

FEPAM is the environmental body from Rio Grande do Sul State It is subordinate to the State Health Secretariat and is in charge of co-ordinating and executing the State environment policy.

FEPAM has developed several training activities in the past years as seen below:

4th Course on Environmental Administration and Planning

This course is described later in this chapter.

First Course on Environmental Education for the Media (television, radio, newspaper and trade unions in the area)

The course was entitled Social Communication and the Environment designed to correct and teach basic ecological and environmental terminology (words and expressions) used by the media. FEPAM decided to develop this course because of the incorrect description of specific environmental news given by the media.

The philosophy of the course was to "inform without deforming". The basic objective of the course is to train journalists, press people, publicity professionals, public relations and tourism professionals in using environmental concepts and terms for environmental news.

The course is being organised by FEPAM with the participation of the Secretary of Health, Public Health School, Communication Faculty of the Catholic University-PUC and the Press association - ARI.

The duration of the course is 120 hours/class for 35 participants.

15th Public Health Course

This course is organised annually by the State Health Secretariat, the Public Health School, the Oswaldo Cruz Foundation - FIOCRUZ and suppported by FEPAM which has contributed with 165 hours/class (the course lasts 800 hours/class) in the following subjects:

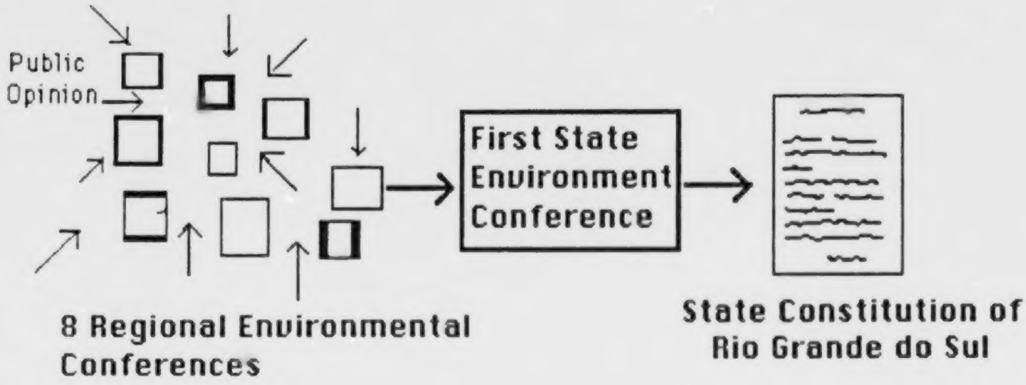
- Transmission disease and bio-ecology - 45 hours
- Environment and sanitation - 60 hours
- Sanitation supervision, workers health and the environment - 60 hours

The course was mainly designed for 30 participants working directly in health care. They are requested to present a final report at the end of the course. For instance one of the reports presented was on the impact on human health, the water control system and air pollution of metalworking. Workers from the metalworking industry participated in this course with support from their trade union. In the last 15 years the course has trained around 450 people.

Conferences on the environment

Three conferences were developed in which the following topics were discussed:

- First conference: Environmental Problems in Rio Grande do Sul State
  In this conference the participants mainly discussed the most important environmental problems in the State.
- Second conference: Survey of Public Opinion on Environmental Topics to Elaborate the State Constitution.
  This event was developed to gather public opinion on important environmental issues occuring in the State in order to support the development of the environmental text of the new State Constitution. The process began with eight local environmental conferences developed in strategic municipalities.
- The information gathered was them selected and discussed at the First Environment State Conference. This conference selected qualitative information to elaborate the State Constitution as seen in the scheme below:


Public Opinion
First State Environment Conference
8 Regional Environmental Conferences
State Constitution of Rio Grande do Sul

The third conference was developed through a public survey to support developing state environmental legislation.

4th State Congress on the Environment

This congress was developed to discuss environmental problems in critical municipalities of Rio Grande do Sul.

Informal talks on environmental issues

This programme was designed to reach the population of the northern coastal area of the State. The basic objective was to inform the population of existing environmental problems in the area and to stimulate them to participate in several events such as reforestation schemes, domestic waste management, environmental conservation and awareness regarding impacts from mining activities and sanitation problems.

State meeting on rice crop technology and the environment

FEPAM decided to develop a three day meeting on how to solve the environmental problems caused by rice agro-industries (eg. water, air and soil pollution).

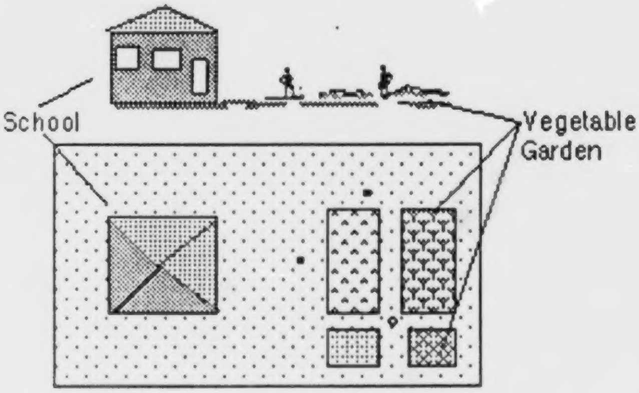
L. Environment Science and Technology Secretariat - SEMANTEC

SEMANTEC is directly subordinate to the Federal District Government - GDF of Brasilia. It is responsible for executing environmental policy and is currently developing two very interesting environmental education projects as seen below:

Alternative food and medicinal herbs and vegetable gardens.

The main objective of this project is to generate awareness towards environmental preservation and public information in schools and surrounding areas.

In short, the project seeks to stimulate primary and secondary school students (and the population in general), regarding the utilisation of natural remedies and alternative health food to improve their health and quality of life.



The students are also expected to work on soil management activities, natural fertilisation of the soil (organic compost from the household) and development of a natural pharmacy.

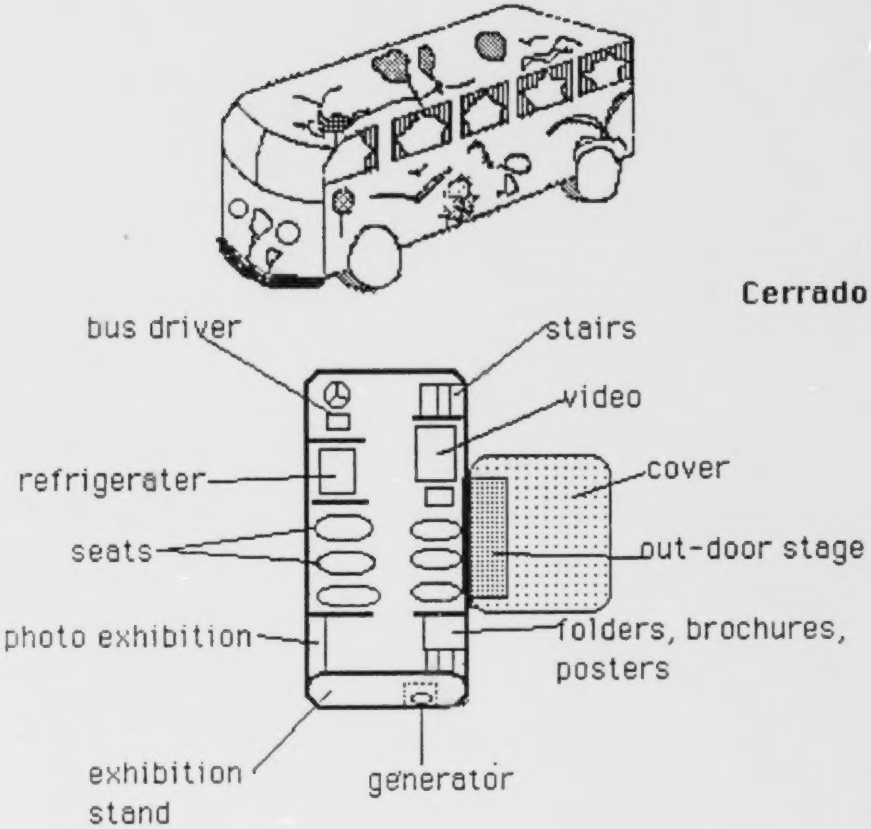
Justifications of the project

Natural healing through natural medicine has been used by the Brazilian indigenous people and forest inhabitants in the past. This type of medicine is free and very rarely has any secondary effects. The main idea of the project is to re-establish these ,practices amongst the population, specially those with low income.

The project involves several governmental organisations such as the Agricultural Secretary, the Education Secretary, Technical Assistance and Rural Extension Organisation - EMATER, regional administrations, the Health Secretary and the Green Apothecary from Brazlandia.

Project: "O Amigo do Cerrado" (the Savanna Friend)

An old bus from GDF was recovered by SEMANTEC and "environmentalised" (painted with ecological subjects such as the fauna and flora of the savanna region) to be used as a moving - dynamic - instrument in developing environmental education activities not only in urban areas but mainly in rural areas of the Federal District and Goiás State. The scheme for the bus is sketched on the next page:


bus driver
stairs
video
refrigerater
cover
seats
out-door stage
photo exhibition
folders, brochures, posters
exhibition stand
generator

Cerrado Friend Bus

the basic aim of the bus is to teach the local populations (mainly those with some type of access to environmental information). simple environmental practices such as gardening. waste recycling. tree planting including notions of water pollution. household wastes and soil erosion.

M. Conclusions

- The environmental organisations and secretariats from the States of Sao Paulo. Rio de Janeiro. Paraná. Minas Gerais. Rio Grande de Sul and the Federal District of Brasilia are those that carry out most environmental education and training in the country.

Brazil has 27 states each one of which has some form of an environmental co-ordination body or division responsible for taking care of the environment. Several of these bodies have developed environmental education and training activities. but according to a report developed by CETESB (1987). only four of them (CETESB. FEEMA. SUREHMA and FATMA form Santa Catarina State). have an internal division or co-ordinating body responsible for developing and co-ordinating environmental training events.

CETESB has the best structured environmental control and training system in Brazil. which is comparable to those of developed countries. It has been developing several internal training activities including providing training to many private enterprises, state environmental organisations, professional training centres, universities and governmental enterprises.

If environmental exhibitions in schools, environmental fairs for the public, individual assistance and talks given in schools are considered, CETESB has provided environmental training information for 54,142 people.

- FEEMA is considered the second most structured organisation on environmental training in the country, but is still not comparable to CESTESB's. It has also been providing professional training courses and training assistance for several environmental state bodies including private enterprises on topics such as environmental impact assessment - EIA and pollution control.
- The other state organisations or secretariats surveyed have not yet developed specific departments for planning, organising and executing environmental training events. Normally these events are organised by the human resource department in conjunction with some other specific division (eg. air pollution control, water quality division and others).
- SEDU and FEPAM have been working together on a very well accepted training course on Environmental Management and Administration.
- FEPAM from Rio Grande do Sul has been the only state organisation surveyed which has developed a health impact assessment component for the public health course organised by the State Secretary of Health. The course has trained around 450 people in the past 15 years, not only from the health care sector but also from environmental agencies and trade unions.
- The states' environmental secretariats have been dealing mainly with environmental education schemes for primary and secondary schools and for the public in general, although some secretariats such as SEDU from Paraná, SMMA form Minas Gerais and FEPAM from Rio Grande do Sul have also been developing short term training courses on several environmental subjects.
- Innovative environmental education and training activities that the environment bodies and secretariats have been carrying out are courses for the media sector (radio, television, news paper and others), in order to correct environmental terms used in giving news, developed by FEEMA and FEPAM; distance training developed by CETESB; planting trees in the "favelas" developed by IEF and the Foundation for Public Parks and Gardens in Rio; the ecological buses developed by SUREHMA in Paraná and by SEMANTEC in Brasília; the "Other side of the Environment" training course developed for public workers by SMMA from Minas Gerais; the alternative medicine vegetable garden developed by SEMANTEC; the conference to survey public opinion on environmental topics in helping writing the state constitution from Rio Grande do Sul and the environmental education campaign developed by SMA to stop the circulation of cars in the city of Sao Paulo for one day.
- The State Programme on Environmental Education is an interesting example of integrated action in which several governmental organisations from Paraná (directly or indirectly related to the environment) have participated. They have been developing different projects separately, although working for the same objectives.

III. Environmental training in universities

This chapter describes the environmental training activites in the main Federal Universities in Brazil including some private ones.

The universities surveyed are mainly the Federal University of Rio de Janeiro - UFRJ, the University of Sao Paulo - USP, the University of Brasília - UNB, the Forestry School of the Federal University of Paraná - UFPa, the Federal University of Rio Grande do Sul - UFRS, the Federal University of Mato Grosso - UFMT, the Federal University of Viçosa - UFV, the Federal Fluminense University - UFF, the Federal Rural University of Rio de Janeiro - UFRrJ, the Federal University of Minas Gerais - UFMG and the privately owned universities of Mackenzie and Souza Marques.

This chapter also describes the Science and Technology Plan for the Amazon Region and North Post-Graduate Project - PNOPG, supported mainly by the Co-ordinating Unit for Superior Improvement - CAPES/Ministry of Education - MEC.

A. Federal University of Rio de Janeiro - UFRJ

In 1963 UFRJ created the Co-ordinating Centre for Post-Graduate Engineering Programmes - COPPE. It is considered the largest post-graduate centre in Latin America. Since the beginning of 1990, COPPE has developed more than a thousand research projects in several specific areas, which include the development of doctorate and master theses. It has also developed technical projects and provided consultancy work for several private and governmental organisations.

Because of it's highly scientific production and qualified academic level it is recognised at the international level by scientific societies.

A large part of COPPE's scientific production is interdisciplinary because it integrates several research areas such as health, sociology, anthropology and fine arts into classical engineering research.

The areas related to COPPE's research activities are: biomedical, civil, electrical, mechanical, materials and metallurgy, nuclear, oceanic production, chemical, transport, computer and system engineering, including an interdisciplinary energy area and interdisciplinary centres.

Interdisciplinary energy area - AIE

The interdisciplinary energy area - AIE has been developing research and training activities in energy and environmental subjects co-ordinated by an Interdisciplinary Energy Centre. The centre has a Master (Msc) programme in economics, sociology, technology and policies. It is designed for full time students, for professionals of several areas including overseas students.

In 1990 the course was structured into three periods of three trimesters, in which 33 credits were offered. In the third period the students participate in seminars offered by the centre (eg. Environment and Energetic Planning). There is also an Advanced Study Programme designed for industries and enterprises, which offers an interdisciplinary curriculum of 500 subjects.

Environmental studies course

In 1989 COPPE created master and doctorate courses in environmental studies. The courses provide students with wide scientific vision of environmental management including knowledge of the rational utilisation of natural resources.

This programme has been systematically developed with the departments of engineering and energy planning.

The course has basic environmental planning disciplines such as effluent treatment, water quality circulation and management, sea and coastal management, air pollution dispersion, risk analysis of industrial development, security parameters, transport and the environment, mass movement in ridge system, remote sensing, environmental impacts of large energy projects, EIA methods and public policies on natural resources.

The students are encouraged to participate in other courses offered by the university (eg. at the institute of geography and geology, biology and nature centre and the mathematics centre), in order to improve and complement their research or studies. After studying a minimum number of disciplines the students are expected to write a thesis and submit it to an examination group of professors for a degree.

Environmental subjects in the graduate engineering curriculum

Several engineering courses offered by UFRJ have included environmental (or environmental related) subjects in their curriculum as seen below:

- Civil engineering: numeric methods in water resources analysis; mathematical models for water quality.
- Oceanic engineering: oceanography; sediments transportation; coastal process; estuaries; oceanographic instruments.
- Chemical engineering: water pollution control; separation process of membranes; particulated systems.
- Transport engineering: transport and the environment.
- Nuclear energy: radiological protection; nuclear accidents analysis; probabilistics analysis of security in nuclear plants; industrial risk evaluation.
- Metallurgy and materials engineering: control methods for environmental problems in mining and metallurgy activities.
- Geography centre: Coastal and plain environments; environmental pollution; remote sensing.
- Environmental engineering: the Engineering School has implemented a post-graduate course on environmental engineering with a duration of 390 hours/class.

Alternative energy

The interdisciplinary centre also offers courses on alternative sources of energy and experiments on the following topics:

- wind energy
- bio-gas
- solar energy
- tide energy
- thermal energy

Post-graduate studies in ecology

The Bio-Science Institute offers post-graduate courses (master and doctorate) in ecology. The duration of the master course varies from one to five years and the doctorate course from two to eight years.

The environmentally related courses offered by the post-graduate programme are:

- Theoretical ecology
- Social-biology
- Plant ecology and stress factors
- Plant interaction with the environment
- Sampling strategies of land ecology
- Land ecosystems and climatic changes
- Computer analysis and ecology

B. University of Sao Paulo - USP

USP is one of the most structured universities in Brazil. It offers courses in a large number of areas through various training institutes. A post-graduate programme on Environmental Science was created in 1989. The course is co-ordinated by an Integrated Inter-Disciplinary Centre. The centre is part of a network involving all institutions and faculties in USP.

The main purpose of the programme is to develop integrated studies of earth dynamics with emphasis on major Brazilian environmental problems. The programme also focuses on environmental impact assessment - EIA of natural resources as well as energy resource utilisation. The basic objective of the course is to give a holistic view, beyond economic evaluation, in human and natural resources utilisation. The programme is planned and co-ordinated by the Inter-Unity Commission formed by professors from several faculties such as Economy, Administration - FEA, Earth Sciences - IGc, Bio-Sciences - IB, Superior Agriculture School - ESALQ and the Public Health Faculty - FSP.

The study subjects in the programme are:

- Appropriate technological administration of natural resources
- Environmental impact
- Policy formulation
- Planning instruments for institutional evaluation and control.

Expected results of the programme

It is expected that the programme will bring the following benefits:

- Improvement in integrated knowledge of natural, human and mathematical sciences to better understand environmental problems.
- Development of a national and Latin American understanding of environmental impact (problem) evaluation.
- Creation of a documentation centre on environmental topics
- Creation of a national and international institutional network on environmental problems and general issues.

Post-graduate course in ecology

The Bio-Science Institute of USP also offers post-graduate courses (master and doctorate) in ecology.

The duration of the master course is from one to five years and the doctorate course from a minimum of two years and a maximum of eight years.

The courses which have a direct connection with environmental issues offered by the institute are:

- Theoretical ecology
- Social-biology
- Plant ecology and stress factor
- Plant interaction with the environment
- Sampling strategies and land ecology
- Land ecosystems and climatic changes
- Computer analysis and ecology

Results from research on university environmental education

In 1988 the first Symposium on Environment and University Education (human science area) was developed, focusing mainly on the State of Sao Paulo, by the Environment State Secretatriat - SMA.

One of the papers presented the results of research developed in 222 universities and faculties regarding environmentally related subjects existing in graduate courses. The research concluded that of the 222 universities, 56 are owned by the government and 116 are private.

The graduate courses that offered courses in environmental subjects are: biology, ecology, geography, agronomy, biological science, nursing school, civil engineering, social studies, architecture and urban studies and sanitary engineering.

There are a total of 98 graduate courses which include environment subjects. The majority of these courses are located in the metropolitan area of Sao Paulo.

The concentration of master courses is smaller (less than the half of the existing graduate courses). They are concentrated mainly in the city of Piracicaba. There are only ten doctorate courses, of which four are in Sao Paulo city.

The graduate courses surveyed provide 471 disciplines on environmental issues. The average duration of these disciplines is 107 hours/class each. In the post-graduate course there are 166 disciplines with an average hour/class of 91 hours each.

In the period between 1980 and 1985 there were 592 master dissertations developed in the biological science area.

From 1980 and 1986 there was a growing number of events such as seminars and symposia regarding environmental issues.

C. University of Brasília - UNB

UNB is located in the Federal Capital of Brasília and offers a master course in ecology, created in 1976. It is currently being co-ordinated by the department of ecology of the Institute of Biological Science.

The course focuses mainly on the "cerrado" (savanna) ecosystem which is predominant in the Central-eastern part of Brazil, and aims at developing environmental impact evaluations due to natural resources exploitation.

The duration of the course varies from one to three years and has a minimum of 40 credits, in which each credit corresponds to 15 hours/class.

To obtain a master degree, a student must accomplish a minimum number of disciplines and write a thesis. The thesis should be submitted to an examination group of professors for approval.

The course offers 20 options in the following areas of study:

- Population ecology (insects) and management and planning of protected areas.
- Bio-climatology, energy balance and hydrological balance.
- Limnology, aquatic productivity and fish ecology.
- Insect ecology and impact of fires in the savanna.
- Vertebrates: ecology and behaviour, animal population, fauna conservation and management.
- Forest-sociology and biomass dynamics.
- Ecological behaviour of human beings and environmental education.
- Natural resources planning and management

- Eco-plant physiology
- Thermal-biology and seed development
- Biological control, insect ecology, ant systematics and paleo-ecology.
- Nutrient recycling, mineral nutrition of native species.
- Morphology, systematics and ecology of continental weeds.
- Environmental evaluation - biological monitoring of humans and mammals in general.
- Ecological behaviour and population ecology.

Centre for Environmental Development

UNB has a project proposal to develop a training centre on Environmental Development. The proposal is currently going through an approval process in order to be financed by the Japanese government.

The main objective of the proposal is to formulate self-sustained environmental development models to be applied in the national development process.

Some of the specific objectives of the project are to:

- develop scientific research to solve environmental problems
- promote seminars, congresses, conferences, lectures, panels and meetings on environmental issues.
- execute environmental consultancy.
- integrate with universities and NGO's
- integrate with the productive sectors (workers, enterprises and state organisations)
- support and promote environmental protection and recuperation of degraded areas.

It is expected that the development of the centre will provide positive results for UNB's academic system. These are mainly developing a doctorate course in ecology, four seminars (in 1991/92/93 and 94) on self-sustained development, formation of an environmental impact assessment - EIA group, setting up an environmental laboratory, developing environmental management methodologies and environmental education models as well as developing natural resources (fauna/flora) management including environmental recuperation methodologies.

The centre is expected to be self-sustained by generating financial resources for the university. It will have a co-ordinating role in the seven following areas:

- Management and utilisation of natural resources
- Recuperation of environmentally degraded areas
- Nature conservation
- Human resource training
- Environmental technologies
- Environmental education
- Environmental medicine

Technical co-ordination will be sub-divided into technical divisions, responsible for executing specific environmental projects.

D. Forestry School of the Federal University of Paraná - UFPa

Forestry activities in Brazil started in 1500 when the Portuguese began cutting down trees and sending high quality wood to Portugal. The intensive exploitation of wood in the past centuries has considerably reduced the forests in the country. This was more intense during the colonisation process which included the expansion of urban areas and industrialisation.

The gradual evolution of forestry activities in Brazil has been supported mainly by governmental policies and fiscal incentives.

The Forestry School of Paraná was created in 1960 and is considered the first school of this type in Brazil. The school has graduate and post-graduate courses (master and doctorate) in forestry studies.

In 1981 Brazil had around 15 forestry graduate courses given by 14 government universities and one private university which graduated 2.248 forestry engineers.

Minimum graduate curriculum

In 1984 a government Decree created a new curriculum for forestry engineers and also expanded the former curriculum by adding one more year to the course (before the Decree it lasted four years).

The following subjects are studied in the course: soils; topography; forest protection; mechanisation and forest exploitation; forestry products technology; wood structure; seedlings; forest management; forest economy; rural extension and conservation of resources (this subject is sub-divided into hydrology, river basin management, conservation, fauna management, administration of natural areas and recuperation of degraded areas).

Post-graduate courses

The forestry school offers post-graduate courses in five different subjects:

- Forestry policy and economy
- Technology and utilisation of forest products
- Forest management
- Seedlings
- Nature conservation

Post-graduate course in nature conservation

This course has the most environmentally related subjects with the following objectives: to train specialists to work with the government and private enterprises in forestry and conservation activities; to develop technological and scientific research; to generate proper knowledge of natural resources management; to train specialists to conduct multi-disciplinary environmental studies and to create a nature conservation study centre.

The basic disciplines offered by the course are: forestry-geography; forest-ecology; nature conservation; micro-meterology; nutrient recycling in forest ecosystems; river basin management; forest fires; dendrology of South Brazil; forest-sociology; education and environmental legislation; ecology of fire; landscape scenery; urban trees; natural park forest management; fauna management; environmental impact analysis; environmental monitoring; nature conservation and special topics on nature conservation.

The labour market for forest engineers

Although there are more than four thousand forestry engineers in the country there is still a deficit in governmental services.

Many forestry engineers normally work with conservation and environmental organisations, state forestry organisations, municipal administrations including private firms and industries such as iron plants and metallurgy.

There is a great demand for forestry projects mainly for industrial consumption. For instance the consumption of charcoal in Brazil went from 15 million/cm3 in 1978 to 34 million/cm3 in 1987, ultilised in iron plants.

At the federal level, Brazil has 134 natural parks, 19 biological reserves, 20 ecological stations, 11 environmental protection areas with a total of 16 million hectares (administered by IBAMA) which represents 1.8 per cent of the country's territory. These areas represent important ecosystems of the Brazilian scenario.

IBAMA has been executing various forestry related activities which demand the participation of forestry engineers. These activities are:

- reforestation and management of Brazilian forests.
- studies and project development regarding forestry technology development.
- sustainable forest production.
- execution of multiple natural resources utilisation and management plans
- adequate use of natural resources utilisation and monitoring of native forests.

School-enterprise forest integration

The need for forest research in Brazil and the lack of provision of such services by official institutions led forestry companies to share in the financing and carrying out of research. As a result there has been increased wood productivity in reforestation schemes and a larger exchange of results and experiences amongst technical and research experts.

In general terms the training of technical experts in organisation and operation of companies has engendered pressure to improve the forest sector in Brazil.

The institutions which are developing school-enterprise co-operation are the Forest-Research Organisation - IPEF, the Foundation for Forest Research - FUPEF and the Society for Forest Research - SIF.

E. Federal University of Rio Grande do Sul - UFRS

UFRS is one of the principal universities in Brazil. There are 26,541 people involved directly with the university, 2,462 of whom are professors. There are also 159 primary and secondary school teachers giving classes for 1,457 students. There are 20,699 students, 16,435 in graduate courses and 2,307 in post-graduate courses. It has 24 faculties, schools and institutes sub-divided into 87 departments and grouped into four areas:

- Area I Technology and mathematics
- Area II Biological sciences
- Area III Philosophy and human sciences
- Area IV Literature and arts

The post-graduate courses which have environmental related themes and subjects are:

Ecological bio-chemics

The course is part of Area II and has a research line on metabolic environmental pollution agents in animals, plants and micro-organisms.

Ecology

The ecology course was created in 1988. It is part of area II, with three research lines:

- Aquatic ecology I and II
- Land ecology I and II
- Urban ecology I and II

F. Rural economy

The course is part of area I and offers research in two areas: alternative sources of energy; and natural resource economy.

Engineering

The course is part of area II and offers master and doctorate courses in: solar energy; wind energy and flow machines; bio-mass; small hydroelectric plants; and rational use of energy planning.

Remote sensing

This course is part of area II and offers master and doctorate courses in: geology; geomorphology; hydrology; environmental analysis; soil reflection; soil mapping; agriculture analysis; image geometry; water deficiency detected by infrared plant analysis; error detection in aerial photogrametry.

Engineering and metallurgy

This course is part of area II and offers master and doctorate courses in environmental studies, focusing on waste treatment and EIA of mechanic and metal mining industries.

Graduate courses

The biology and earth sciences graduate courses (eg. biology, geography, ecology and others), normally have environmental subjects in their curriculum. But there has also been an increase in environmental related subjects in four engineering courses developed by UFRS as seen below:

Course	Subject
• electric engineering • mechanic engineering • metallurgy	Fundamentals of applied ecology
• Chemical engineering	Hygiene and work security I. The course also offers the following topics: environment, working , environment, environmental education, environmental sanitation, air pollution and methods and analysis for air pollution control.

G. Federal University of Mato Grosso - UFMT

The university has developed a course for specialists in environmental education financed by the United Nations Environmental Programme - UNEP and by the Co-ordination for Superior Level Improvement - CAPES.

The basic aim of the course is to train qualified people to work with environmental education at all levels (Federal, state, municipal and in the private sector). It also trains trainers in disseminating environmental education methods and techniques by highlighting the environment as an interdisciplinary network of sciences.

This course was originally a follow-up from the one previously developed by UNB.

The contents of the course are: environmental education techniques; environmental education strategies; environmental information system; environmental impact.

The course has drawn a multidisciplinary team of participants from several areas such as engineers, geologists, lawyers, sociologists, geographers etc from Brazil and other Latin American countries.

It is structured in two blocks. The first is the basic interdisciplinary integration regarding subjects such as economy, ecology and environmental policy analysis. The second is related to specific environmental information: history, perspectives. Latin American experience and environmental education methodologies.

H. Federal University of Viçosa - UFV

In 1991 UFV created an Environment and Ecology Research Centre-NEPEMA to manage and execute all environmental activities in the university.

The basic objectives of NEPEMA are to:

- co-ordinate and integrate human, financial and material resources to solve environmental problems.
- develop research activities to improve environmental knowledge as well as environmental protection and improvement techniques as well as the sustainable use of natural resources.
- promotion of environmental studies and the development of consultancy work for private and public organisations
- promotion of training activities as well as improvement of the environment.

The centre has been working in the following areas: water, soil and air; industrial and agriculture wastes : conservation and preservation of the ecosystem : bio-diversity and environmental engineering.

I. Federal Fluminense University - UFF

The department of civil engineering of UFF, located in the city of Niteroi , Municipality of Rio de Janeiro, has planned to execute an extension course on environmental science.

The course will cover the following topics: ecology, natural resources, vegetation, energy sources, organic pollution, chemical pollution, soil pollution, environmental impact assessment - EIA and environmental impact study - EIS, radioactivity, water treatment, water management, social impact on the environment, environmental planning and education and the environment.

J. Federal Rural University of Rio de Janeiro - UFRRJ

The university is located in the rural part of Rio de Janeiro State and was set up there in order for students to participate in practical rural activities such as agriculture, cattle farming, veterinary science and forestry.

The university has several other graduate courses (such as physical education, biology, family planning and several engineering courses), but very few cover environmentally related subjects.

One of the basic and first implemented graduate courses was agricultural engineering. It has a wide curriculum which includes some environmentally related subjects, such as general aspects of ecology, natural resources conservation and agrarian ecology as an optional subject.

Although the university is located in a rural area there are no specific graduate courses on ecology or any other environmentally related subject.

K. University Souza Marques - FTESM

An interesting example of environmental training was developed by the ecology course (that is part of the graduate course in biological sciences), of the privately owned University of Souza Marques located in the State of Rio de Janeiro.

For several months the students from this course did research and tested natural techniques to recuperate deforested areas in "Grajau" natural park due to fires and wood chopping by locals.

The training consisted in recovering the areas through natural means learned by simply observing nature.

The students identified the best recovering species for the specific ecosystem through long observation and periodical research developed over several months.

L. Mackenzie University

Mackenzie University is also privately owned and is located in the State of Sao Paulo. It has created post-graduate courses (master and doctorate) on environmental sanitation. The courses were designed for students from several graduate areas such as engineering, exact sciences, human science and biological science.

M. Federal University of Minas Gerais - UFMG

UFMG gives a 40 hours/class specialisation course on environmental impact assessment - EIA. The course is open to professionals working in the field as well as university students.

No further information was obtained about this training course.

N. Science and technology plan for the Amazon Region 1990/91

This plan is headed by the Regional Research Commission for the Amazon, CORPAM, which is currently co-ordinating the Northern Post-Graduate Project, PNPG.

The plan is a joint venture involving 11 universities and training/research institutions in the region.

The basic aim of the plan is to train local people and then employ them in local institutions and organisations.

The areas in which training and research activities are being developed are:

- environment and natural resources
- human population
- health
- agriculture and cattle ranging
- economy and sociology
- technology

The basic objective of the first area (environment and natural resources) is to study and do research into environmental protection activities and environmental recuperation methods. Special attention is being given to forest management and technologies to recuperate and preserve the Amazon ecosystem.

O. Northern Post-Graduate Project - PNOPG

This project will be located in the northern part of Brazil, in the Amazon region and will be implemented in the third National Post-Graduate Plan financed by the National Research Council - CNPq -, the Superior Studies Co-ordination Unit - CAPES - and the Project Financing Agency - FINEP.

Ten per cent of the whole Brazilian population live in this region, but it contains only one per cent of the total post-graduate courses in the country. This represents a deficit of 1,200 post-graduate people in relation to the country's average.

In 1986 there were 18 post-graduate courses, 13 master and five doctorate. In the recent past, ten new courses have been started, five in human sciences and six in earth sciences (which includes environmental topics).

There are 581 students attending these courses, 544 in the master programme and 37 in the doctorate programme. The number of students in post-graduate studies increased by 52 per cent between 1986 and 1989.

The environmental courses programmed for the period of 1990/93 are bio-technology (energy); forest management; plant health (sanitation); biology; botany; climatology; soil treatment; ecology; water biology; and tropical soil management.

The numbers of students attending the above mentioned courses (till 1989) are:

• biological science	1
• water biology	25
• botany	24
• ecology	33
• forest management	9
Total	**103**

P. Conclusions

- All universities visited (UFRJ, USP, UNB, UFRS and UFRPa) have developed post-graduate programmes on subjects akin to environmental studies, such as energy, ecology and forestry. Other universities such as UFV, UFMT, UFF and UFMG are beginning to implement research and short term courses on other environmental subjects such as sanitation, environmental impact assessment, EIA, and environmental education.

- The Coordinating Centre for Postgraduate Engineering Programmes, COPPE, of UFRJ in Rio de Janeiro offers some of the best courses in the country. It has an Interdisciplinary Centre with a master and doctorate programme on energy planning which trained 233 students up to 1990. The centre also started a master and doctorate programme on environmental studies in 1989.
- USP also implemented a master programme on Environmental Science in 1989. The course is coordinated by an integrated interdisciplinary centre which is part of a network involving all institutions and faculties in the university.
- There has been a gradual introduction of environmental and ecological topics into some of the graduate engineering courses in the country. For instance the engineering school of UFRJ has nine engineering courses with obligatory environmental (or environmentally related) subjects in their graduate curriculum. UFRS has four courses with environmental subjects and the agricultural engineering course at UFrRJ has three ecologically oriented disciplines in its graduate curriculum.
- There is currently only one postgraduate (400 hours) course on environmental education in the country. The course is developed by UFMT to train environmental educators to work in schools and governmental environment agencies. It is financed by UNEP and CAPES and supported by IBAMA.
- The forestry school of the Federal University of Paraná, UFPa, has identified some confusing expressions used by some universities and training centres regarding the definition of the environmental activities they develop, for instance the terms interdisciplinary centre, trans-disciplinary centre or multidisciplinary group have a general concept but have no clear meaning.

IV. Scientific and research financing agencies

Several national scientific and research financing agencies including the United Nations Development Programme, UNDP, have been giving technical and financial support to environmental training programmes in Brazil. Some of the most relevant training programmes and projects developed by these agencies are described in this chapter.

A. Statistics from the National Scientific Research Council - CNPq

CNPq is one of the main sources of funds for scientific research in the government. It is also responsible for providing several types of scholarships or grants for universities, government organisations and state-owned enterprises. The fellowships given are for candidates to study in Brazilian universities or in universities abroad.

They are for specialisation, improvement, scientific development, visiting researchers, research, recent doctorate degree holders, technological initiation, visiting professors, visiting developers, research interns, scientific initiation, masters, doctorates and post-doctorates. The total number of scholarships in ecology (that includes the environmental study area) given in 1990 were the following:

- research support for ecology 228
  (out of 20 research centres and universities)
- training in ecology in national universities 100
  (out of 10 universities)
- training in ecology abroad 11

CNPq invested US$ 2.14 million in human resources training in 1990. The distribution of financial resources for the training programme on ecology in several Brazilian states is seen below:

State	%	US$ thousand
Sao Paulo	39.8	854
Federal District	15.5	291
Rio de Janeiro	10.5	225
Amazon	9.1	195
Rio Grande do Sul	8.3	179
Minas Gerais	4.1	88
Other States	14.4	309

The universities and research institutions that have been receiving above US$ 80 thousand per year for the training programme on ecology are:

Institution	Resources in thousand US$
University of Campinas	264
UFASCAR	213
Amazon Research Institute	195
University of Sao Paulo	190
Federal University of Rio Grande do Sul	63
Federal University of Rio de Janeiro	143
Brazilian Technology Institute	82
Others	639

There are currently 171 students undergoing postgraduate studies in ecology in Brazilian universities, as well as some universities abroad.

B. Training programme on strategic areas - RHAE

This programme was implemented in 1988 by the ex-Ministry of Science and Technology with support from CNPq. Its objective is to improve and train people in strategic areas such as bio-technology, computers, precision techniques, new materials, fine chemicals, energy and the environment.

The programme has been giving scholarships for students willing to study in national or international universities. It also seeks to improve existing working groups in enterprises, universities and institutions and creates new training courses in these institutions.

In the first years of the implementation of the programme (1988/89) RHAE provided 16.567 scholarships for 453 institutions to train students in national and international institutions.

The demand for scholarships in bio-technology for students willing to study in Brazilian universities is:

Region	Students
Northern	5
North-eastern	455
South-easthern	952
South	1.332
Central west	1.250

The relationship between the requirements for scholarships in bio-technology by governmental organisations and private enterprises in 1989 was:

• State organisations	3
• Private enterprises	250

The relationship between training demand in bio-technology and scholarships given by RHAE in 1989 was:

• demand	3,994
• sponsorships given	1,394

The relationship between the fellowships given by RHAE and CNPq is:

Organisation	International fellowships	National fellowships
RHAE	41,3%	43,9%
CNPq	39,6%	51,4%

The types of scholarships given by RHAE are internships, special improvement, master, doctorate, post-doctorate degrees, technological development or initiation, visiting professors and special visitors.

The environmental training activity areas are sub-divided into three blocks as seen below:

Technical area

- management and planning
- conservation units
- use and occupation of the soil
- environmental impact assessment - EIA
- review and analysis
- environmental education
- water sanitation
- solids

Operational area

- quality control
- environmental control
- extension studies

Research

- air
- water
- soil
- fauna
- flora
- legislation
- social-economic

C. Project financing agency - FINEP

FINEP is a governmental body responsible for financing technical and scientific co-operation projects in Brazil. FINEP's environmental programme has the following objectives:

- to advertise the environmental resource programme in order to finance environmental projects.
- to support a wide range of human resource training, especially in areas in which Brazilian know-how needs to be improved.
- to support the development of environmental programmes and projects in universities, governmental technological centres and private enterprises as to the use of environmental control equipment.
- to support the development of environmental programmes and projects with public and private institutions involving universities, research centres, enterprises and environmental organisations.
- to support the creation of environmental information systems.

Environmental science sub-programme - CIAMB

The general objective of the programme is to develop a scientific and technological base to include environmental issues in the Brazilian development process.

The specific objectives of the project are:

- Human resources training

This topic will be applied at the postgraduate level to train qualified people to work with environmental issues.

- Generation of technological know-how

This topic is related to the development of interdisciplinary projects in order to generate knowledge of the dynamics of the environmental process.

- Development of environmental technology

This topic is related to the development of methods, processes, techniques, diagnosis, prognosis, prevention, correction and recuperation of environmental quality.

Objectives of the programme

The basic objectives of the programme are to support five postgraduate programmes (master and doctorate); support ten research and development projects, including publishing, and to develop a diagnosis to define research on environmental science.

For the first objective, the main strategies are to support and develop scientific exchange and increase scholarships for environmental training in Brazil and for Brazilian students to study abroad.

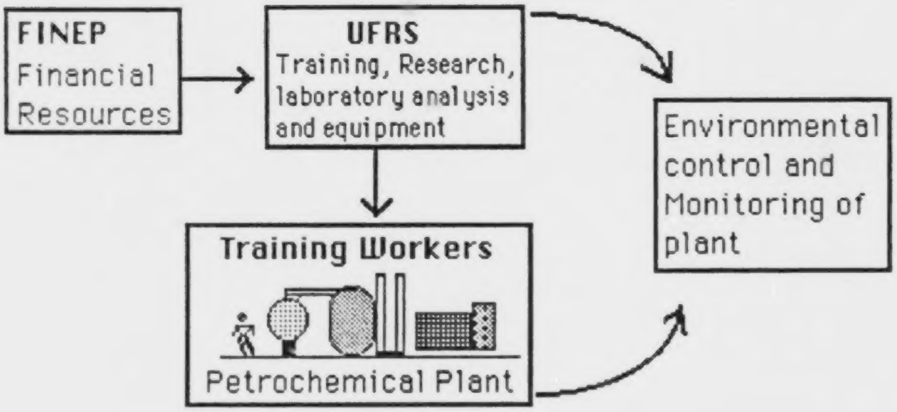
The programme budget is estimated at US$ 14,134,000.00, and will be supported by the Inter-American Bank.

FINEP training

An environmental training programme was financed by FINEP and developed by the Federal University of Rio Grande do Sul - UFRS. The main objective of the programme was to develop an environmental control system for a Petrochemical plant located in Rio Grande do Sul State.

FINEP and the plant financed a research and training programme co-ordinated by the university which provided a laboratory with equipment for physical-chemical analysis. It also designed a research and training programme on environmental control procedures, laboratory analysis and monitoring schemes especially for the workers in the plant.

This example of specialised in-plant training is highlighted in the scheme below:


FINEP
Financial Resources
UFRS
Training, Research, laboratory analysis and equipment
Environmental control and Monitoring of plant
Training Workers
Petrochemical Plant

Internal training

In 1990, FINEP developed a training course on environmental impact assessment, EIA, for its staff. The course lasted two months and aimed to inform participants of the general EIA process in Brazil due to an increasing demand for EIA projects requesting financial support from the agency.

D. UNDP-Brazil: Projects related to protection of the environment

The United Nations Development Programme, UNDP, has been assisting the Brazilian Institute for Environment and Renewable Natural Resources, IBAMA, including other organisations directly and indirectly involved with the environment, in supporting the execution of environmental projects with some training activities as seen below:

- Project BRA/87/017 - **Human resources development through the Training Centre for Economic Development - CENEC.**

  This project aimed at training personnel involved in the planning process at the national, regional and local levels in order to incorporate environmental issues in all areas of planning.

- Project BRA/87/020 - **Assistance to SEMA (the former Federal Environmental Agency) in the formulation and implementation of the National Environment Policy.**

  This project has elaborated a new strategy for human resources development in environmental management.

- Project BRA/87/021 - **Training programme on the formulation, administration and evaluation of projects for the Amazonian Region.**

The origin of this project arose from the irregular and indiscriminate past development of the region, which often adversely affected the environment. It aims to promote integrated regional development including productive use of forests and other natural resources while preserving them as well as surrounding ecosystems. To meet these goals the project has an extensive training programme to improve the technical capacity of government agency staff in formulating, appraising, managing and supervising investment projects in the Amazon. This project is being developed by the Central-west Region Department, SUDECO.

- Project BRA/87/004 - **Development of the Central-west Region (SUDECO)**
  Here, the aim of the project is to protect the environment and indigenous population including the implementation of training units to strengthen the technical capability of SUDECO and other government agencies.

- Project **BRA/87/012 - Wood and furniture industry (State of Mato Grosso)**
  This project aims to develop a land use policy and an effective forest management programme to provide long-term wood resource security in the threatened forests in the central-west State, which is the southernmost part of the Amazon. It provides on-the-job training and management courses to improve productivity, product quality and job safety.

- Project BRA/87/008 - **Agrometerological and hydrological support to the irrigation programme - PRONI**
  The objectives of this project are to survey and disseminate information on the climate, soil and water available for agriculture and suitable for irrigation. Training for the use of agrometeorological knowledge in the management of irrigation programmes is also being provided.

- Project BRA/87/007 - **Integrated forestry development in the northeast of Brazil**
  The need for development of experimental models for sustained use of the forest prompted this project. It propagates uses of forest products for energy, pharmaceutical and other purposes. Training in the management of forestry development programmes for the region, including community leaders, is also being undertaken.

- Project BRA/90 - **Incorporation of the environmental dimension in irrigation programmes and projects**
  Environmental reference frames for the planning and execution of irrigation programmes and projects were needed. The project trains technicians in order to meet its objectives and develop guidelines for the elaboration and evaluation of environmental impact studies - EIS's.

- Project BRA/90/003 - **Support for IBAMA for implementing the National Programme for Control of Industrial Pollution - PRONACOP**
  This project was implemented in order to strengthen the managerial capacity of IBAMA in the fields of pollution programme monitoring, technical training, acquisition of industrial pollution monitoring equipment.

E. Conclusions

- Three Brazilian agencies - CNPq, CAPES and RHAE - mainly provide fellowships for post-graduate studies in the country and for Brazilian students to study abroad.
- In the period of 1988/89, RHAE provided 16,567 scholarships for 453 institutions in various areas such as environment, energy, bio-technology, computer techniques, precision techniques, new materials and fine chemicals.
- CAPES has also been giving scholarships for post-graduate studies and has supported several training programmes such as the Specialized

Courses on Environmental Education developed by the Federal University of Mato Grosso, UFRJ, the Northern Post-Graduate Project, PNOPG, for the Amazon region and the Programme to Support Scientific and Technological Development, PADCT.

- FINEP and CNPq are also responsible for financing many scientific and research projects in the country, which often involve environmental training activities such as the above mentioned PNOPG and PADCT.

The project Training of Human Resources, FRH, of the PADCT programme will also be providing scholarships for post-graduate courses: specialisation, masters, doctorates and post-doctorates.

- FINEP has an Environmental Science Sub-Programme, CIAMB, which is developing the following areas: human resource training, development of environmental technology and generation of technological know-how in areas in which Brazilian know-how should be improved: environmental impact assessment, EIA, ecosystem ecology, eco-toxicology, environmental information and natural resources management.

- Since 1987, UNDP has sponsored nine projects concerned with environmental training activities in several areas such as pollution control, environmental management, forest management, environmental impact assessment, EIA, and environmental impact study, EIS, for irrigation projects and environmental policy.

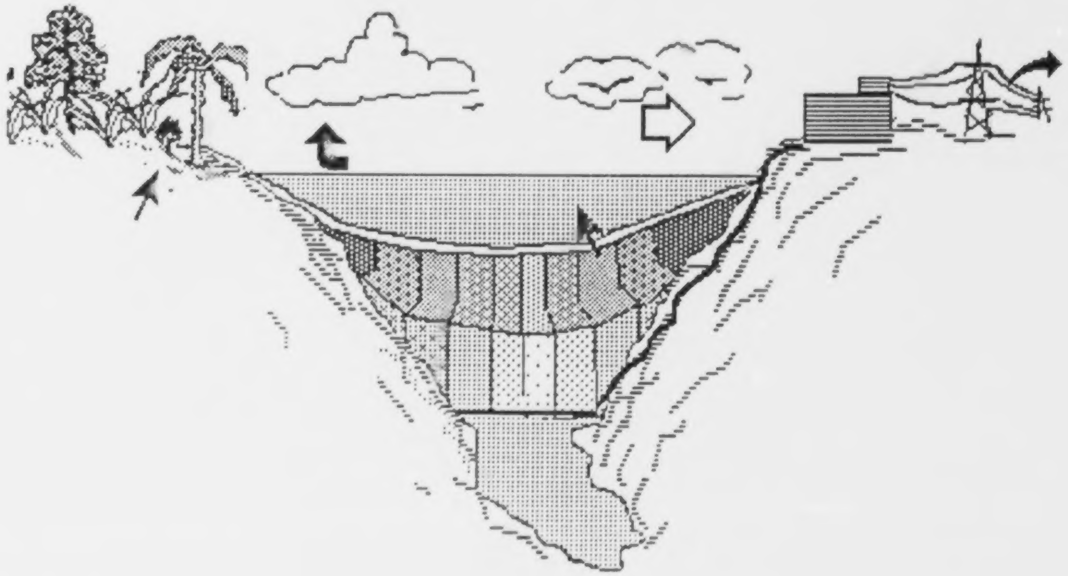
V. Government enterprises

Federal and state owned enterprises play a very important role in the national social and economic development process. They have contributed various development plans and projects in the country and are gradually establishing relevant environmental studies of these initiatives, in order to avoid negative impact on the environment.

Some of the enterprises which have concrete experience of environmental training are the Brazilian Power Company-ELETROBRAS, the Brazilian Oil Company-PETROBRAS, the National Nuclear Energy Commission-CNEN, Angra Nuclear Power Station-FURNAS, the Brazilian Agricultural Research Enterprise-EMBRAPA, and the Technical Assistance and Rural Extension Organisation in Minas Gerais State-EMATER/MG.

A. ELETROBRAS

Growing importance has been paid to environmental concerns in the implementation of development plans and programmes in the Brazilian energy sector. ELETROBRAS is responsible for having implemented large-scale hydroelectric power plants such as Tucuruí and Balbina. These and others have generated many adverse impacts on the environment.



But in recent years growing environmental awareness has reached the company and environmental action has been progressively taken into account in the execution of large projects.

In August 1989 the company had 1.425 specialised people working directly with the environment. Around 37 per cent of them have university degrees and 33 per cent work on social and economic issues. Of the 33 per cent, 24 per cent work on biotic issues, 22 per cent at the physical level and 21 per cent in the management-administration area.

Human resources development

ELETROBRAS training policy seeks mainly to improve the technical skills of its employees, largely those working directly with environmental issues.

Two basic types of training have been executed by the company. The first is related to the conservation and recuperation of the environment and the social systems of affected areas. The second is related to the environmental training needs of each enterprise within the Brazilian Power Sector[4].

ELETROBRAS training policy has three different executive sectors responsible for developing three types of training courses namely: management and development; technical improvement and technical qualifications

Environmental management course-CGMA

The course was designed for environmental managers from the enterprises in the power sector. It was developed in two stages. The first is a national stage and the second is an international stage. The duration of each stage is 20 days designed for 25 participants.

The whole training programme is supposed to last five years. Two courses have already been developed, one in 1987 and the other 1988. Only in 1989 was the first stage of the course completed.

According to positive feedback from the first two courses, great interest has been shown by other organisations, institutions and universities to take part in these events.

Future plans are to duplicate the national stage and undertake one course each semester.

Environmental technical course-CIMA

This course has only developed one environmental subject (i.e. human settlement planning). It is designed for professionals with a direct or indirect working relationship with power companies concessionaires. The course lasts a week and is designed for 15 participants.

During the course there are a lot of discussions and simulation exercises on the identification and evaluation of environmental impacts due to the establishment and operation of energy generation projects.

The first course was developed in 1988. In 1990 further courses were developed on interference in indigenous communities, fauna and flora and human settlement planning

Basic course on the environment-CBMA

This course was designed for new employees in the power sector. It focuses on a wide range of social and environmental aspects and political views regarding the activities of several organisations that form the Brazilian power sector.

The duration of the course is one week for 20 participants.

Seminars

Beside training courses, ELETROBRAS has also carried out seminars through joint programmes with universities and some environmentally related institutions. The cost of the seminars is estimated in US$193 thousand.

Seminars on flora and fauna rescue, reservatory cleaning and environment monitoring are planned for 1991/93.

Two of these seminars have already been developed. The first was developed with the Federal University of Santa Catarina-UFRS, namely the International Seminar on Population Resettlement. The second was Impacts Of Transmission And Distribution Systems.

B. PETROBRAS

PETROBRAS is a national holding for oil exploitation and processing. It has several subsidiaries and industries that add up to around 60 enterprises, such as oil processing plants, research centres and oil industries.

Many activities developed by PETROBRAS have caused (or are causing) negative environmental impacts, mainly from oil exploitation in the sea and in the Amazon region. This includes also oil perforation residues, air pollution and other environmental destruction factors.

Growing environmental awareness in the company is mainly due to three factors: the public and scientific environmental movements around the world, the National Environment Policy-PNMA and environmental laws. From 1988 onwards the company began implementing environmental training events for its staff.

PETROBRAS has a human resource division - SEREC - which has recently undertaken a survey to identify training needs in all its concessionaires (enterprises directly related to the company) with emphasis on their specific operational areas, for instance air pollution from an oil processing plant.

The survey has also identified training opportunities in different regions of Brazil. Training events are organised and executed mainly by two training centres located in the states of Bahia and Rio de Janeiro, although on certain occasions specific training events are developed strategically elsewhere.

Specialists course on the environment-CEAMB

In 1989 PETROBRAS developed the first specialists course on the environment. It was initially designed for 30 participants working in the company.

Based on the success of the courses as well as the experience acquired in other environmental training events, the company decided to develop a second CEAMB in 1991.

The course was open to 45 participants, 40 from PETROBRAS and five vacancies offered for other organisations.

The course's objective is to transmit basic environmental knowledge for workers dealing directly with environmental affairs.

The disciplines of the course are grouped into the following categories:

- Introductory disciplines: oil and by products, laws, industrial security, occupational health and quality guarantee.
  Duration: 42 hours/class
- Environmental technology: air, water and soil pollution and construction and engineering development in the sea.
  Duration: 76 hours/class
- Ecology: anthropology, sanitation, eco-biology and soil conservation.
  Duration: 60 hours/class
- Environmental management: environmental impact assessment-EIA, environmental management and planning, environmental legislation and licensing and contracting activities.

Practical Activities

It is planned for participants to visit oil industries and their environmental control and monitoring schemes. The duration of this phase is estimated to be 16 hours.

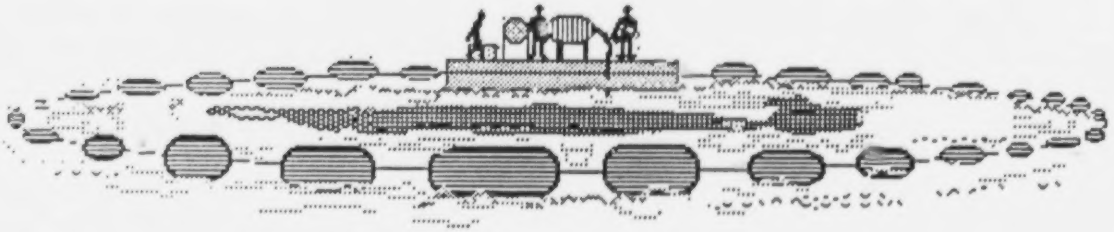
Participants will also develop seminars, internal discussions on environmental subjects including the presentation of working group exercises. The duration of this phase is estimated to be 16 hours.

Course on oil spill pollution control

PETROBRAS and UNDP developed the first Oil Pollution Control (Model) Centre-CEMPOL in 1983. The project was designed not only to control oil spill pollution problems in the sea but also to train people in oil control technologies. The centre is located in the coastal region of Sao Paulo State.

The course provides practical and theoretical classes on oil pollution control in the sea. Participants are expected to gain knowledge of ecological problems due to oil spills, physical and chemical aspects of crude oil reactions with the sea, oil dispersion, oceanographic and climatic factors regarding oil dispersion.

They also learn how to manipulate and utilise special equipment to restrain oil slicks and recover oil from the sea.



Target group

The course is mainly designed for the people working at PETROBRAS, but also includes participants from external bodies such as the state environmental agencies, the Brazilian navy, the Brazilian Docks Company-PORTOBRAS and other organisations that are directly involved with the sea.

The duration of the course is five days, designed for both middle level technicians and university graduates.

CEMPOL has developed 34 courses, in which 836 participants have been trained, 747 from PETROBRAS and 89 from other organisations.

Contents of the course

- introduction to the course
- environmental legislation
- back-up targets
- contention barriers
- oil recovery equipment
- chemical combat
- treatment and final disposal of oil waste recovered.

Other training events

In 1990 PETROBRAS developed four courses and two seminars in which 120 people were trained. These training events consist of four courses on: solid waste treatment, residual water treatment, environmental licensing and submarine effluent discharge, projects and seminars on the Amazon as well as PETROBRAS.

C. Angra Nuclear Power Station-FURNAS

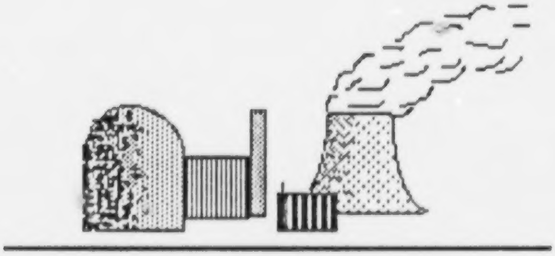
The Brazilian nuclear power plants of Angra I and II are administered by FURNAS. It is a mixed government and privately owned subsidiary of the ELETROBRAS holding, created in 1957. It is engaged in electric power generation and transmission in the southeastern and part of the central western regions of Brazil.

The energy supplied by FURNAS in 1989 came from the following energy sectors:

hydroelectric plants	8,1%
thermal plants	0,7%
nuclear plant	2,2%
purchased and borrowed power	6%

In 1968, the Brazilian government decided to enter the field of nuclear power generation (electricity production) and in the 70s it began constructing the first nuclear plant of 600 MW in the Municipality of Angra dos Reis, State of Rio de Janeiro. Commercial operation started in January of 1985.

Two other plants (Angra 3 and Angra 4) are under construction to be completed in 1995 and 1998 respectively. The three units together will produce 3,116 MW, utilising uranium dioxide (UO2), enriched to about three per cent of U-235.



All activities carried out during the design, construction and operational phases of nuclear facilities in Brazil are licensed and controlled by the National Nuclear Energy Commission-CNEN. The plant is also controlled by the International Atomic Energy Agency-IAEA and the Institute of Nuclear Power Operations-INPO.

The plants have a combined set of passive and active safety systems to protect the plant and the surrounding environment against emergencies.

Training activities

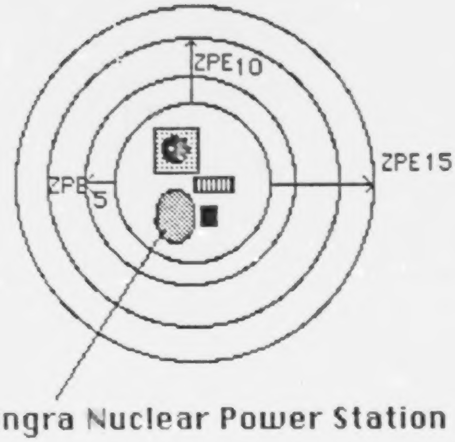
The training activities designed for operators provided by FURNAS (with the support and approval of CNEN) are identical to those performed for nuclear operators in developed countries.

In accordance with the existing standards, advanced operator training is administered in Spain and the United States using simulators with characteristics fully compatible with those of the ANGRA 1 control room.

Besides basic training the operators are required to take, a general course once a year including the simulation of abnormal and accident conditions.

Emergency evacuation training

The Brazilian Civil Defense and FURNAS have sub-divided the nuclear power plant direct influence area into three emergency planning zones-ZPE. The first area is denominated ZPE 5 km (radius), the second ZPE 10 km and the third ZPE 15 km, as seen in the scheme below:



The above-mentioned organisations have started training activities for these areas and give information regarding emergency situations that might arise with the plant.

Emergency evacuation training has been carried out mainly by the Brazilian army which divided the training activities into three different stages. The first involved only 100 soldiers who simulated a short evacuation scheme of the area.

The second training session involved 1,000 volunteers from the ZPE 5km area. The simulation lasted a whole day and was organised by various bodies at the federal, state and municipal levels (e.g. civil defense, fire brigade, FEEMA-State Environment Organisation, public bus company-CTC, communication enterprises and other support bodies).

The third training event is planned to be the "grand emergency simulation". It will be held in the near future involving the entire population of the ZPEs-5, 10 and 15 km. The simulation will involve around 64,000 people living in these areas.

FURNAS and the Civil Defense have undertaken several conferences and talks including the distribution of folders on environmental procedures in emergencies.

This campaign involved the whole population of the ZPE's areas shown below:

Area	Conferences	Students	Adults	Total
ZPE-5	25	1046	818	1865
ZPE-10	16	499	412	911
ZPE-15	74	5380	1671	7051
Total	115	6925	2901	9827

Public information

The plant has a public information centre that provides visitors with information concerning its operational system through display panels, educational films, audio-visual aids, scale models and illustrative boards. The centre also includes an auditorium for lectures and film projections.

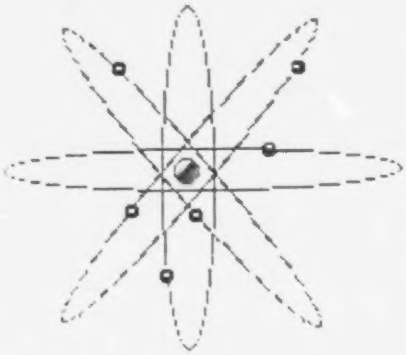
FURNAS delivers and takes part in lectures at enterprises, trade unions and associations. It also promotes tours of the nuclear facilities and keeps frequent contact with local municipal governmental authorities in Angra dos Reis and other municipalities, for daily reports on the plant's performance and activities.

FURNAS is also planning to develop an information booklet to be used as an environmental education instrument in municipal schools in the region. It has also developed an environmental information programme for municipal school teachers regarding the plant's activities.

D. National Nuclear Energy Commission-CNEN

CNEN is considered as an interface between the International Atomic Energy Agency-IAEA and all Brazilian organisations that develop and utilise nuclear energy.

IAEA forms a part of the United Nations system and provides development assistance in numerous fields where nuclear techniques offer advantages over others or serve as valuable adjuncts to them.



The areas in which IAEA provides technical support are: health, agriculture, industry, hydrology, radiation protection, environmental monitoring, generation of electricity and energy in general. IAEA focusses assistance mainly on developing countries. It has supported CNEN in developing several projects in Brazil, many of which have a direct bearing on the environment. These projects have been training people in Brazil and abroad as seen below:

Project BRA/0/010 - Isotope aided studies in the Brazilian Amazon
This project was mainly developed to continue quantitative dynamic studies of the water cycle over the Amazonian Basin, both on regional and local scales.

The main objectives of the project are the immediate evaluation of the existing situation, determination of short term changes and effects on the ecosystem and recommendations for future action. This action includes sustainable crop production in the Amazonian region, rational use of water sources as well as the implementation of an environmental monitoring system for land use development.

The project has installed laboratories, developed research in the agricultural field and trained personnel for the planned work.

Ten people from the project have been sent abroad for training in research institutions and universities.

Project BRA/5/023 - Studies on pesticide residue in food and the environment
The main objective of the project is to identify the residues arising from pesticides use in the soil, plants, food and animals by means of radiochemistry and other analytical techniques.

Project BRA/9/017 - Safety analysis: Angra nuclear power plant Units 1 and 2
The main objective is to improve experience and capability of CNEN staff in safety analysis review and inspection of the plants.

Project BRA/9/028 - Radioactive effluent monitoring
Three people are to be trained in the evaluation of radiology impact on the environment due to liquid and gaseous release from nuclear installations.

Project BRA/9/029 - Emergency and preparedness
This project aims to test emergency plans and to establish a training programme for radiological protection for off-site response and to complete technical guides relating to emergency responses. The fields of activity are radiation protection, safety of reactors, environmental protection and emergency planning and preparedness.

Project BRA/9/031 - Emergency dose assessment
The expressed purpose of this project was to strengthen local capability for dose assessment and atmospheric dispersion during nuclear power plant accidents.

Four fellowships have been allocated to train people from the project abroad.

Project BRA/9/033 - Licensing and surveillance of nuclear facilities
This project provides technical support for training and development of professional capability at the Brazilian regulatory agency as related to control, surveillance, accident prevention and licensing procedures for nuclear installations.

Project BRA/9/034 - Medical and environmental aspects of the Goania accident
Ten people are being trained abroad to enable them to make an evaluation of the 137 Cs (cesium) dispersion in the environment and carry out biomass studies on individuals involved in the accident. The fields of activity of the project are environmental protection, radiation protection, and post-accident environmental monitoring.

Project BRA/9/035 - Radiation protection in medical practice
Its purpose is to implement basic radiation protection principles in the medical area through systematic quality control and quality assurance programmes. This project is to establish a national inventory and control system for radiation sources and to train medical and administrative staff.

Institute for Radiation Protection and Dosimetry-IRD

IRD was created in 1960 to supervise the National Nuclear Energy Commission-CNEN as regards radiation security.

The basic activities carried out by IRD are the following:

- operational nuclear control
- effluent control, environmental impact assessment-EIA and radio-ecology research.
- radio-diagnosis, nuclear medicine, radio-therapy and plant analysis
- operational conditions evaluation and control of medical and industrial ionizing radiation.
- environmental monitoring
- evaluation of personal/population contamination
- national and international technical-scientific co-operation
- technical training

Training and Scientific Support Department-DETAC

DETAC is in charge of supporting activities such as training, research control, orientation of post-graduate theses, know-how exchange, dissemination of information and technical-scientific data.

DETAC has a research and training division responsible for improving technical knowledge as well as training external personnel from the industrial and health sectors.

The division also develops courses, seminars, congresses, conferences and internships under technical co-operation agreements with other institutions.

It has a post-graduate commission to support the development of master and doctoral theses in the institute or other training institutions/universities in Brazil or abroad.

From 1980 to 1989 IRD gave 186 courses (including other events) and trained 5,084 people. IRD has a group of 40 courses of which eight are related to environmental issues as seen below:

- Nuclear power plant security
- Nuclear emergency
- Evacuation of Angra do Reis town
- Workshop on radiation protection
- Field work monitoring
- Radiation protection and environmental impact
- Regional course for Latin America in the determination of radiation in environmental and food sampling

A seminar has also been carried out on the environmental and sanitary importance of mercury pollution in gold mining.

People trained

IRD has been training people from the Ministry of Public Works to control the use of radiation machines that are normally used in hospitals, laboratories and private clinics. It has also trained the fire brigade, armed forces, health officers and medical doctors, school teachers and university professors and several participants with other university degrees.

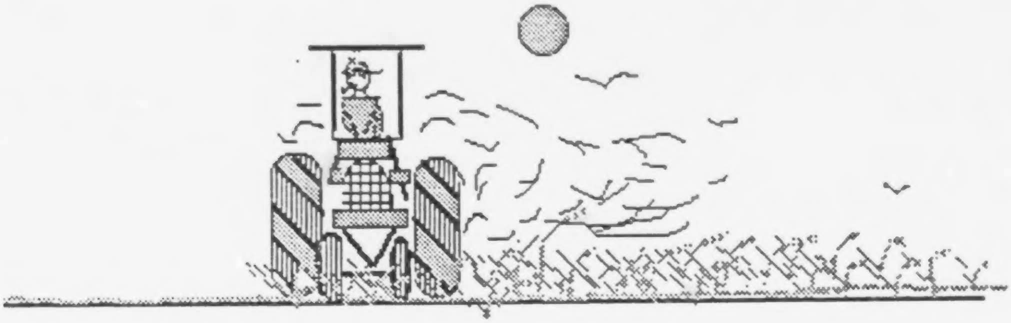
E. Brazilian Agriculture Research Enterprise-EMBRAPA

EMBRAPA was created in 1973 by the Ministry of Agriculture. It has a basic slogan "research begins and ends with farmers", meaning that the responsibility has spread well beyond the limits of the laboratories and experimental fields.

Two goals were set by EMBRAPA. The first was aimed at training agricultural personnel in different fields at the best centres in Brazil and abroad. This allowed the establishment of competency paradigms in comparable terms with the best existing farming research. The second was aimed at developing a multifaceted technological base to relate several ecosystems.

These would then be adapted to the different technological standards adopted by farms throughout the country.

The research and training fields that EMBRAPA has focused on are grain, fiber, fruit and vegetables, soil and seeds, natural resources and the environment, technology development and cattle farming.



EMBRAPA commands 42 research institutions which, when combined with the national research centres, adds up to 96 units. One of its main policies is to play a leadership role in "green" technology research and training, by reconciling ecological problems with the need for food production.

Research and training centres

EMBRAPA's agricultural research co-operative system centres are:

- National Production Research Centre-CNPP
- Regional Natural Resource Research Centre-CRPRN
- National Specific Research Centres-CNPI
- Service and Support Research Units-USAP
- State Executive Research Units-UEPAE
- Research State Institutions-IEP

The above research centres have been developing training programmes specially for EMBRAPA's technical staff. A good example is the National Programme of Forest Research-PNPF developed in conjunction with the former Brazilian Institute of Forestry-IBDF (now IBAMA).

The basic objective of the programme is to stimulate and execute research activities in the field of forestry. This programme was further extended to other research organisations as well as governmental universities (eg. University of Sao Paulo-USP and Federal University of Viiosa-UFV), including private universities, institutions and a great number of farmers.

Courses offered by the research centres

EMBRAPA's research centres offer several courses related to agricultural and cattle farming development and many of these courses, although they do not contain the word environment (or environmentally related terms), nevertheless include environmental theory and practice.

The courses, seminars, talks and meetings for 1991 were:

- Seminar on agro-forestry system implantation
- Seminar on biological control for fungus and nematoides
- Agricultural defense (environmental impact)
- Biological control an agriculture activities
- Soil biology as an important component in agriculture production
- Post-graduate course on soil microbiology
- Green agricultural fertilizers
- Meeting on the evaluation and biological control of insects
- Third seminar on environmental agriculture and cattle farming activities
- Course on environmental dynamics of herbicides in the soil
- Agriculture and the environment
- Multi-disciplinary meeting on soil conservation and management
- Five meetings on soil conservation and management
- Soil biology course
- Ecological tourism course
- Fourth meeting on biologic control of plant disease

In 1990 EMBRAPA's training programme offered 13 training courses (out of 205 courses specifically on agricultural subjects) on environmental issues. For the training programme in 1991 ten new environmental courses were added representing an increase of 11 per cent of all courses offered by the enterprise.

National Programme on Bio-Technology and Agriculture Development -PNPBA

This programme seeks to develop research activities and train people in animal health, molecular and celular biology, food technology and fermentation, soil biology and plant sanitation. It involves several research centres including universities such as UFRJ, UNICAMP, USP, ESALQ, UFV and UFRS. The activities of the programme are centralised in the Centre for Genetic and Bio-technology-CENARGEM, with the following objectives:

- to develop bio-technology methods to be used in agriculture, agro-industry and cattle farming production.
- to develop productive bio-technology models.
- to help establish a global bio-technology policy in Brazil.

National Irrigation Research Centre-CNPAI

The centre develops research and training activities on climate, soils, ecology, botany, genetics, agricultural engineering and energy.

National Agricultural Research Centre-CNPDA

The main objective of this centre is to promote and co-ordinate the development of scientific and technological knowledge in the following areas:

- biological control of insects and pests
- environment protection
- health analysis of food

National Forestry Research Centre-CNPF

The centre is in charge of developing the National Forestry Programme-PNPF, which aims to develop forestry economic research, wood quality research, seedling research and know-how in wood energy.

Semi-arid Research Centre-CPATSA

The centre was created to study the different natural resources and socio-economic activities in the Brazilian semi-arid region. The basic aim of the centre is to generate know-how in agriculture and cattle farming technology. It also develops research in the relationship between plants-water-solids-animals and the environment.

Humid-tropic Agriculture Research Centre

The centre was created to study the different natural resources and socio-economic activities in the Brazilian tropical humid region. The basic aim of the centre is to generate know-how in agriculture and cattle farming technology. It also develops research in the relationship between plants-water-solids-animals and the environment.

Centre for Agricultural Research of the Pantanal Region-CPAP

The centre is developing an environmental preservation programme to reach an equilibrium between natural resources exploitation with low environmental degradation.

F. Technical Assistance and Rural Organisation-EMATER-MG

EMATER's basic aim is to develop agricultural production and productivity. This includes the improvement of the income of farmers and improvement in the quality of life of the rural family.

There is normally one EMATER for every Brazilian State. Each State contains regional and local offices located mainly in the agricultural production areas.

Lack of time only permitted contact with the EMATER[5] from the State of Minas Gerais regarding environmental education and training experience, as shown below:

Energy

- development of bio-energy in agricultural activities
- development of energy network in rural areas
- support for alternative sources of energy development

Agricultural economy

- development of agricultural infrastructures.
- decrease in agricultural production costs.
- implementation of rural administration, marketing and agricultural supply.

Other areas in which EMATER has been providing assistance have been: forest and reforestation, irrigation and drainage, soil conservation in agricultural practice, mechanisation of rural areas, quality of life of the rural population and storage facilities for rural production.

EMATER has also been developing studies to reduce the use of agricultural chemicals in order to protect crop production, preservation of water sources, preservation of green areas in farms and to match rural development with environmental preservation.

The Organisation has been assisting a wide range of people as seen in the table below:

Public	**period of 1985/88**
agricultural producers	210,000
youth	108,000
leaders	19,500
rural women	100,000
workers	50,000
total	487,500

EMATER depends financially on the Federal and State governments including certain municipalities of Minas Gerais. The economic constraints from which the Brazilian Federal government suffers are affecting all governmentally-owned organisations directly (and indirectly). Therefore EMATER's budget has been lowered considerably, affecting not only the development of normal agricultural programmes but also the execution of training activities.

EMATER's training division has planned several reforestation programmes for Minas Gerais. The following programmes are awaiting financial support:

- Reforestation to produce wood in farms
- Reforestation for local rural projects
- Reforestation of the Green River Basin
- Forest for the Environment Project-FLORAM
- Rubber tree development
- Reforestation of micro-basins
- Development and conservation forestry programme
- Reforestation in farms
- Reforestation programme for small farmers

These programmes will all together reforest around 4,310 hectares (43 km^2), to compensate for the area deforested by several industries such as pulp and paper, iron industrial plants, ceramics, cement and bakeries. It is also estimated that the programmes will benefit around 617,200 farmers through 500 local EMATER offices.

The training activities will be divided into practical and theoretical classes. The practical classes will involve planting techniques, conservation measures and seedling techniques. The theoretical classes will consist of ecological notions on reforestation, soil conservation and water improvement.

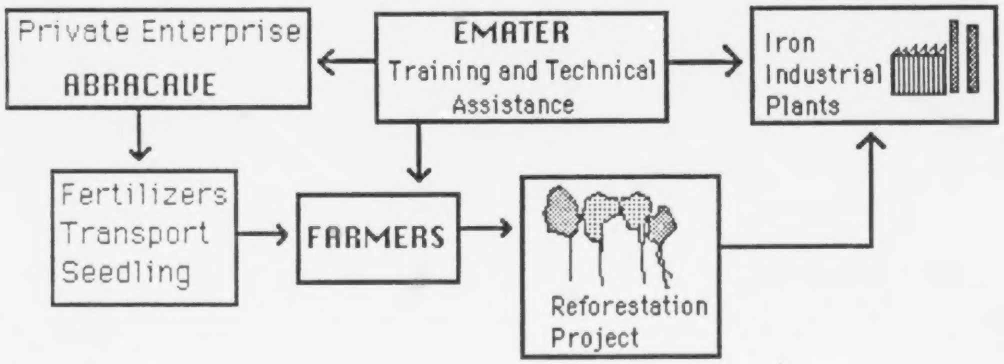
Training activities

EMATER has developed training programmes for several Brazilian organisations such as the Brazilian Association for Charcoal-ABRACAVE, iron industrial plants, Brazilian Institute for the Environment and Natural Resources-IBAMA, including the Food and Agriculture Organization-FAO. It has also provided training for urban and rural municipal school teachers.

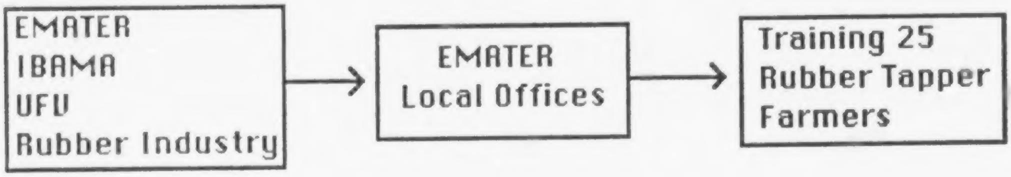
Training activities developed by EMATER may have the following steps: a particular enterprise (for instance ABRACAVE) provides infrastructures such as transport, agricultural chemicals, seedlings and other materials for local farmers.

The farmers execute reforestation activities on their farms. EMATER provides technical assistance and training activities on reforestation practices.

The wood produced by the reforestation schemes is sold for the charcoal based iron plants. Some plants also have been developing reforestation projects with technical assistance from EMATER. EMATER works as follows:


Private Enterprise
ABRACAVE
EMATER
Training and Technical Assistance
Iron Industrial Plants
Fertilizers
Transport
Seedling
FARMERS
Reforestation Project

Another training activity developed by EMATER was executed in conjunction with IBAMA, the Federal University of Viçosa-UFV and the rubber industry. These bodies set up a training course for the local EMATER office representatives in several municipalities of Minas Gerais. The course focused on rubber tapping techniques was planned as follows:


EMATER
IBAMA
UFV
Rubber Industry
EMATER
Local Offices
Training 25
Rubber Tapper
Farmers

After the positive feed-back of the course it was then applied as an experimental model to be executed later in other municipalities.

"Rio Verde" Green River Basin Training Experience

The sub-committee of Rio Verde Basin is formed of several organisations related directly and indirectly to the environment. These organisations normally give technical advice and often provide material resources (e.g. laboratory sampling equipment), to carry out environmental prevention and control activities.

The main concern of the committee is to control and improve the quantity and quality of the water from the river.

The committee has periodically undertaken water analysis from several sampling points with special emphasis on the lower part of the river where polluting elements (e.g. zinc, mercury, chrome, phosphates, manganese, sewer affluent, eroded soil and other pollutants), are concentrated. The pollution is mainly due to industrial activities, use of agriculture pesticides and soil erosion.

5th Seminar on Rio Verde Hydrographic Basin

In October 1990 a seminar was developed to discuss reforestation and training for technical support.

The seminar lasted five days during which local technicians from EMATER discussed the following topics:

- reforestation
- importance of economical, social and ecological reforestation
- perspectives of hydrographic basin reforestation
- sanitation
- discussion of case studies
- results of similar experiences in neighbouring municipalities regarding reforestations

The committee has also developed seminars on environmental issues such as water quality, soil pollution, chemical pollution, erosion and deforestation. The seminars are designed for a large group of people working with the municipal departments of public works and health, school teachers, NGOs, environmental groups, civil defense, school and college students, service clubs and environmental law offices.

G. Conclusions

Almost all governmental enterprises surveyed have a department or division dealing with environmental affairs. Most of them have a training department which organises environmental training events mainly for internal staff. The environmental training events organised and co-ordinated by these enterprises have normally invited specialists, including experts and professors from other institutions and universities, to give classes. Very little involvement has been made, in the organisation of these events, with IBAMA or even with the state environment agencies which have wide experience with the country's environmental policies, history and problems.

On the one hand, these enterprises have been progressively investing more in environmental training since the end of the last decade, but on the other hand, there have been severe financial cuts from the federal government due to the economic crises the country is going through.

ELETROBRAS is a good example of investment in environmental management and control. In 1989 it had 1,425 people working directly in environmental activities, of which 37 per cent had university degrees. In the past five years the company has invested in environmental courses and seminars which have provided training for 130 people.

The human resources training division-SEREC from PETROBRAS has been developing an environmental specialisation course in which 75 people were trained between 1989 and 1991. The company also trained 836 participants in oil pollution control organised by CEMPOL and developed several environmental seminars and short term training courses in 1990.

EMBRABA has been developing several training activities since 1973, mainly through its training and research centres. It has also pioneered alternative research and training in the field of alternative (natural) methods in agricultural development, such as integrated pest management-IPM, soil conservation, green fertilizers and biological control of insects.

EMATER has been providing technical assistance and training events for farmers about energy (alternative sources of energy such as wind, sun and water), agriculture economy and environmental recuperation in the rural area of Minas Gerais State.

The nuclear power plant Angra I and II has been frequently criticised by the scientific community and the public in general for its location and lack of infrastructure for emergency situations. Despite this, according to FURNAS, it has one of the most secure systems in the world.

It has been carrying out several environmental training and education activities not only for its own staff but also for the population that lives around the plant's installations.

CNEN and IRD are not very well known organisations in the environmental area but have been performing several important training events related directly and indirectly to the subject.

The Vale do Rio Doce Company-CVRD, a large half private and half governmentally-owned enterprise, has been developing remarkable environmental management and control activities at the Ferro Carajçs Programme-PFC in the Amazon region. But no environmental training event has been organised by the company, which normally sends its employees to external training events.

VI. Vocational training and the environment

Brazilian vocational training in environmental subjects is mainly developed by the National Industrial Teaching Service - SENAI which has key schools working with specific training programmes in different states. These schools are mainly the Industrial Leather Processing School, the Technical Sanitation School, the Centre for Chemical and Textile Industrial Technology - CETIQT and the Centre for Chemical Teaching - CISBC.

This chapter approaches training activities related to the Brazilian workers' organisations and a case study from a small municipal waste recycling plant.

A. SENAI

SENAI is run by the Brazilian National Industry Confederation. Each of its regional departments (there is one in each State) comes under the State Industry Federation.

The basic aim of SENAI is to train workers in the industrial sector. It has 500 training centres and 270 mobile training units which offer courses in 300 different occupations. Up to now SENAI has trained around 12 million technicians all over the country including some students from other Latin American countries.

SENAI and the environment

SENAI has developed environmental control know-how through international co-operation with the United Nations Industrial Development Organisation - UNIDO and the United Nations Development Programme - UNDP.

The main training areas developed are effluent control in the tanning (leather) industry, food production, chemical industry, textile industry and, more recently, sewage treatment.

The technical co-operation programme has enabled SENAI to develop specialised laboratories, pilot plants and laboratories capable of moving to distant operational areas.

Over the last decade SENAI has developed a number of projects, as seen below, to help industries mitigate environmental degradation:

- **Project BRA/80/166** - Establishment of a pilot tannery effluent treatment plant
- **Project BRA/87/024** - Mitigation of environmental pollution caused by agro-industries in the southern region of Brazil
- **Project BRA/87/033** - Effluent treatment in the textile industry

These projects have achieved extremely satisfactory results which can be measured by the following data:

- a group of 34 technicians trained in the design and operation of effluent treatment plants.
- around 300 industries served by a technical assistance programme, reaching 16 states in various regions of Brazil.
- creation of 23 effluent treatment plants designed by the technical group.
- the establishment of a tannery effluent pilot plant in Estancia Velha, Rio Grande do Sul State.

- the establishment of five operational effluent laboratories located in Rio de Janeiro, Sao Paulo, Paraná, Santa Catarina and Rio Grande do Sul.

The Brazilian industrial sector has benefited extensively from SENAI's experience, technological assistance and training activities. People from Africa and other Latin America countries have also been trained by the SENAI system.

Effluent treatment in leather tanning industries

In Brazil, the tanning industries discharge approximately 20 million m^3 of liquid effluents in the environment. These effluents have a very high bio-chemical oxygen demand-BOD and high concentrations of chrome and sulphides which seriously pollute water sources.

It is for this reason that a project to control effluents in leather industries was developed with the United Nations Industrial Organisation - UNIDO to assist the leather industry in controlling liquid effluents; evaluating the effective costs of different control systems; developing training activities for enterprises, environmental organisations and scientific societies; developing research programmes and demonstration programmes to disseminate technology in the State of Rio Grande do Sul and other Brazilian States as well as other Latin American countries.

The project is executed by SENAI's leather industrial processing school located in the State of Rio Grande do Sul. The school began its training activities in 1965 and is considered the only one of this type in the whole continent.

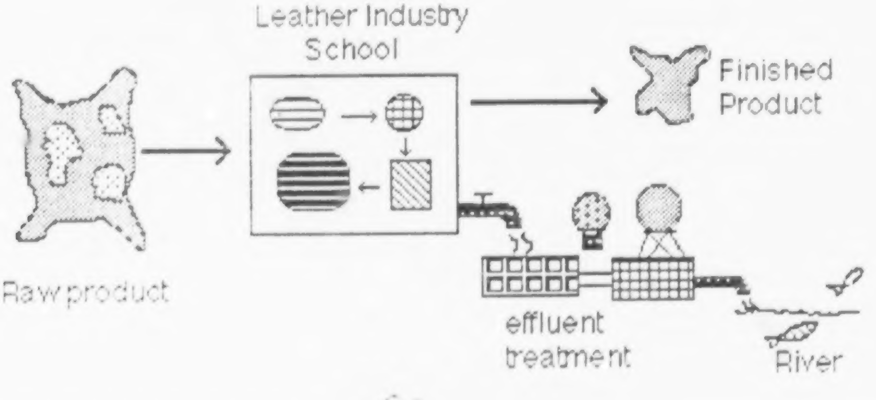
Training activities

Training has been carried out to train specialists to work in effluent control of tanning industries. A total of 26 industries have been assisted up to now including some environmental organisations.

The pilot plant has an international standard that is applicable to the whole of Latin America. There have also been special training events conducted away from the pilot school in several other states, for example:

- a one week debate on effluent control in leather industries.
- seminar on leather industry effluent control.
- technical talk developed for the Leather Industry Association of the north-eastern and northern regions of Brazil, including the employers' federation of Sao Paulo.
- seminar on effluent treatment for the Industrial and Commercial Association of Divinopolis in the State of Minas Gerais.

A general scheme of the training system developed by the leather school is outlined below:



The School receives raw materials (raw leather from local farms). The students learn how to process the leather and to treat the effluents from the industrial out-puts. The finished products are sold in the market and the treated effluent can be discharged into water sources causing no environmental problem.

Technical leather course

This course is given to participants at the secondary school level with a duration of four years, full time.

Special technical tanning course

This course is given to participants finishing secondary school. The duration of the course is two years, full time.

Special courses

These courses are designed for professionals needing to develop specific knowledge in industrial processes. The courses on environmental topics are:

- Analytical control of industrial effluents
- Design of a depuration control system
- Maintenance, operation and depuration control system
- Basic notions of effluent treatment

Special training programmes

These programmes are designed for variable activities such as practical and theoretical classes and internships to improve the skills of professionals from one or various enterprises.

Intensive leather processing course

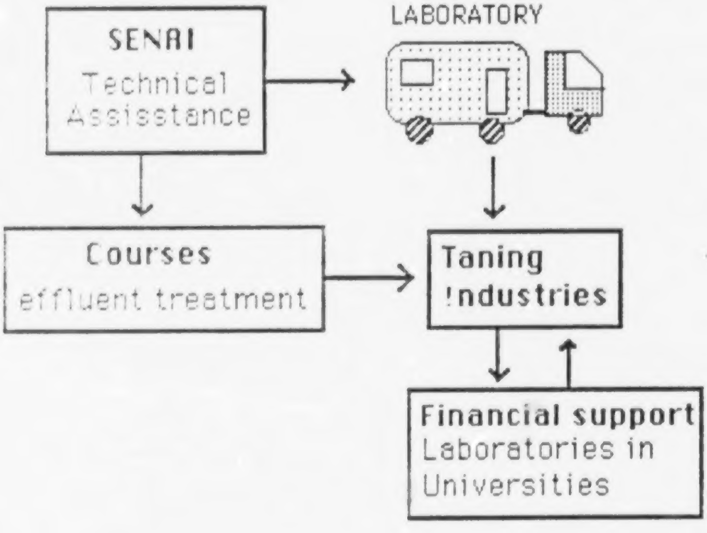
This course is developed each year and lasts two months (120 hours/class), designed for 25 participants.

Moving an effluent treatment laboratory

The leather school also has a mobile laboratory for providing training activities and technical assistance to several municipalities not only in Rio Grande do Sul but also in other States.

This specific training scheme has been working as follows: the leather industry finances the setting up of laboratories in universities.

The universities provide technical assistance and organise training courses (e.g. Basic notions on effluent treatment and chemical analysis of effluent treatment) as seen in the scheme below.



SENAI supports the scheme by providing not only technical assistance for the above mentioned industries with a mobile laboratory, but also by structuring training courses.

Project BRA/87/024/99/A/1 SENAI/UNDP - Decreasing environmental degradation caused by agro-industries in the south of Brasil

SENAI also provides technical assistance and organises training activities for agro-industrial plants for milk, meat and oil, including the wine and candy/sweets industries.

The basic objective of the project is to decrease environmental impacts caused by these industries by controlling liquid effluents and solid waste.

The training activities of the project are to train responsible technicians for the analytical control of an effluent treatment system and train responsible people to operate the effluent treatment system.

Students' profile after training

After completing the courses the students are capable of executing the following tasks:

- programming an industrial production system
- establishing a flow chart system
- working in laboratory tests
- controlling production quality
- elaborating technical reports
- developing manuals and folders designated for the training of personnel
- controling the quality of raw-materials
- giving technical assistance to engineers and other professionals

Pollution control of agro-industries

The leather school has also been developing training activities in environmental control of agro-industries. It has trained ten students in agro-industry effluent analysis and two technicians from two agro-industries in effluent analysis.

The pilot plant in Santa Catarina State has trained three technicians from three agro-industries in laboratory characterisation of industrial refuse, effluent flow determination and analytical control of effluent treatment systems.

The pilot plant in Paraná State has undertaken the following training activities:

- trained 18 students in effluent operation process and treatment.
- trained 12 students in effluent treatment and analytical control
- trained 22 professors from the Technical Sanitation School on effluent treatment.
- trained one technician from the tannery from Curitiba, capital of Paraná State, on chemical oxygen demand analysis.

Technical Sanitation School

In conjunction with SENAI, UNDP developed an Industrial Effluent Treatment Project which permitted the creation of the first sanitation school in Brazil in 1987.

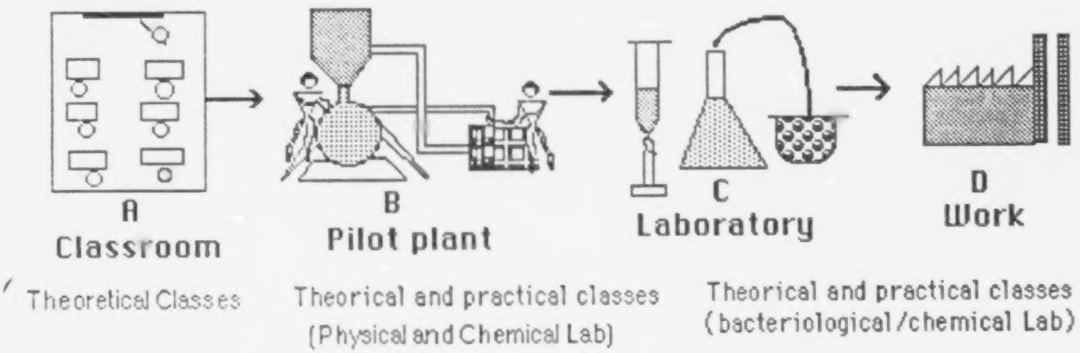
The school is located in the State of Paraná and was set up to develop training courses for medium level students of different enterprises, in order to improve their knowledge and skills in sewage treatment, and of both municipal and public sewage plants.

Training programme

The training programme developed at the school is sub-divided into four stages.

In the first (A) the students learn basic subjects such as mathematics, chemistry, physics and hydro-biology. In the second stage (B) - first semester - the students learn to operate and monitor a water treatment plant. The third stage (C) - second semester - they learn to operate a sewage plant. These three stages add up to 1,400 hours/class or two semesters. After the course the students have to undertake a practical working period (D) of 720 hours at a sewage treatment plant (e.g. industrial plant) in order to apply what they have learned in real conditions.

Training stages A, B, C and D are outlined below:


A
Classroom
Theoretical Classes
B
Pilot plant
Theorical and practical classes
(Physical and Chemical Lab)
C
Laboratory
Theorical and practical classes
(bacteriological/chemical Lab)
D
Work

The course is entirely free and the students may receive a scholarship during the school period. Food and accommodation are paid for by the student or sponsored by the enterprises to which they are linked.

The school has classrooms with audio-visual materials, laboratories for analysis, a water distribution network, water pumping systems, a water treatment station, stabilisation lagoon and "Imhoff" tank for practical classes.

Some of participants are from governmental water sanitation companies or from industrial plants. The others are unemployed and are selected according to their school attainments.

SENAI has also provided courses to the Federal University of Paraná - UFPa in order to qualify students from the engineering school in water sanitation treatment. It has also prepared training packages for private and governmental organisations.

Environmental Control Training Centre

SENAI is developing a project to set up a training and consultancy centre at the Technical Sanitation School. The centre will work with soil, air and water pollution control with emphasis on the following areas:

- analysis of water and soil residues (e.g. metal and agrotoxics).
- analysis of solid residues (e.g. domestic wastes).
- air pollution analysis (e.g. agro-industries).

Effluent treatment in the chemical industry

In 1985 SENAI created a Centre for Chemical Teaching in Sao Bernardo do Campo, State of Sao Paulo. Its main objective is to train people and improve know-how in the field of chemical industrial processes. The centre was set up mainly due to lack of technicians in this specific field in the Brazilian labour market.

The centre was strategically developed in the above-mentioned city because of the high concentration of chemical industries (around 86 per cent of all chemical industries in Brazil in 1984/85 were located there).

As for environmental training, the centre has facilities for effluent treatment of metallic surfaces and a bio-digestor. It has also developed a technical co-operation contract with the Company for Technological Development and Pollution Control-CETESB, which provides courses and technical assistance in industrial pollution control.

The centre also has a mobile laboratory unit installed on a truck to provide technical assistance and training for enterprises.

Centre for Chemical and Textile Industrial Technology - CETIQT

The textile industry in Brazil is considered to be one of the most important productive sectors. It is formed by around 5,000 industries (11 per cent are large scale, 21 per cent are medium scale and 68 per cent are small scale plants).

In 1984 it was estimated that around 80 per cent to 90 per cent of these industries discharged polluting effluents in water sources generating several negative environmental impacts. For this reason SENAI and UNIDO developed a training project to process and control solid and liquid refuse from these industries.

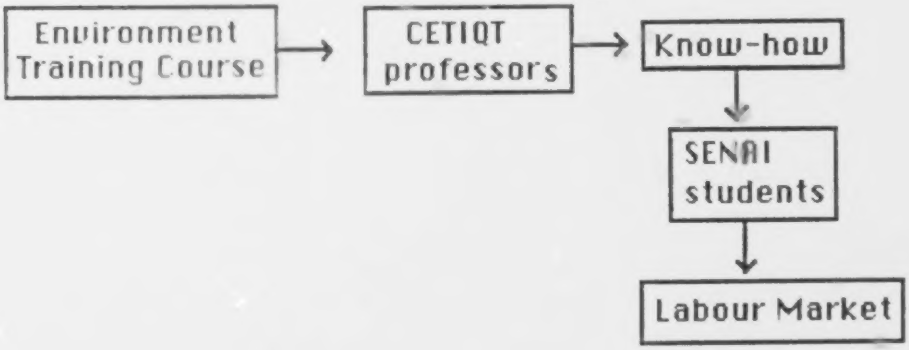
Training workers

Training activities at CETIQT aim to train people responsible for:

- analytical control of existing systems.
- an effluent treatment plant.
- work in the (effluent control) labour market.
- Training systems developed

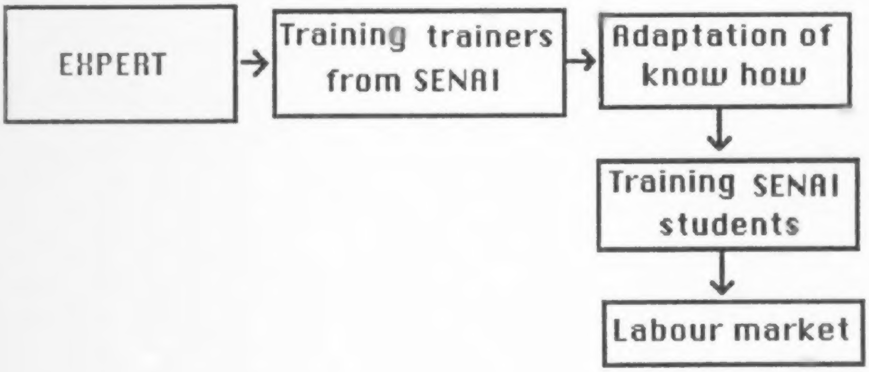
CETIQT has developed two types of training activities. The first is when an expert in effluent control systems in the textile industry is invited to give a specific course on effluent treatment for SENAI's professors. The expert may come from a national environmental organisation or university, or even from an international institution.

SENAI is still in the process of learning and adapting classical technologies from developed countries, therefore the know-how acquired during the training event is used to structure regular courses for students as seen in the scheme below:



The second type of training is when CETIQT trainers participate in external training courses developed by other organisations (e.g. State environmental organisations or universities).

After the course the trainers organise a training course to transfer the know-how to their students. This training process is seen below:



First training course in textile effluent treatment

This course was designed for three different groups. The first for effluent treatment managers at medium and university level, the second for students with complete schooling (primary and secondary) and the third for SENAI's technical students.

Training programme for 1991

The following courses were programmed for 1991:

- Environmental legislation
- Preliminary treatment
- Primary treatment
- Secondary (biological) treatment
- Slime treatment and management
- Analytical control
- Maintenance, security and hygiene
- Pollution reduction techniques

How are training needs identified?

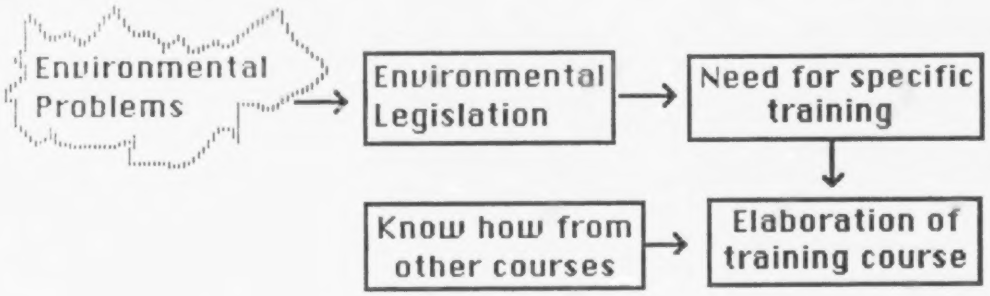
Environmental problems (e.g. water pollution) caused by textile industries require corrective measures. For this reason the Brazilian government has passed laws and norms to control the problems.

The new environmental regulations normally require new technologies and know-how to control environmental problems. The implementation of new technologies usually demands the organisation of training events to train workers to operate environmental control schemes.

As a consequence, SENAI has set up several training events to match the new governmental regulations on effluent control of textile industries.

CETIQT has set up several courses on effluent control normally based on previous training experience and know-how gained from technical assistance provided by the organisation to firms and industries.

This training scheme is seen below:


Environmental Problems
Environmental Legislation
Need for specific training
Know how from other courses
Elaboration of training course

Two different types of courses have been developed by the centre. The first is specifically for workers from industries to be trained in certain industrial effluent control and treatment techniques (e.g. biological treatment, chemical treatment and others), from textile industries. In this case the duration of the course is 40 hours/class designed for 15 participants.

The second type of course is provided for unemployed students. In this case the duration of the course is 36 hours/class designed for 30 participants.

The experience gained in these courses is also used to develop training packages contracted by private firms and industries.

Students have all possible facilities in the training courses for practicing and learning new techniques. The classes use audio-visual displays such as videos, slides and overlays.

CETIQT also has an integrated laboratory network (e.g. effluent laboratory, fibre laboratory, physical experimental laboratory, colour analysis laboratory and chemical experimental laboratory) structured for training activities and technical assistance.

Last but not least, training activities developed by CETIQT are part of a technical assistance strategy provided to industry by offering first technical assistance and then developing a training package specially designed for the industrial plant (e.g. biological treatment efficiency for a medium level industrial plant).

B. Workers' organisations

During the survey in Brazil three workers' organisations were approached. The first the National Agricultural Workers Organisation and Confederation - CONTAG in Brasília, the second was the Workers Central Union - CUT and the third was the General Workers Confederation - CGT, both located in the State of Sao Paulo.

CONTAG

The first organisation affirmed that no environmental training activities were currently being developed or planned for the future. They mentioned that in 1986 some meetings were held with the Brazilian Institute for Natural Resources and Environment - IBAMA (formerly the Federal Environment Agency - SEMA) in order to begin setting up an environmental course for workers, but due to political decisions and changes in the government the course was not organised.

CUT

The second organisation also affirmed that no training course was being organised by them and that all training events (e.g. work and security) were normally developed by the metalworking unions. However, they also stated that ecological topics were sometimes evoked in these courses.

CGT

The third organisation affirmed that they also did not organise environmental training events. But they highlighted a training effort in the State of Rondônia in the Amazon region in which the local workers' organisation had pressured a multinational Brazilian/Canadian Mining Enterprise - BRASCAN into developing reforestation activities in the areas in which they had developed mining activities. At that time there was also a discussion about creating a training centre for workers in the that area.

They also mentioned that a training centre would be developed as a joint venture of 80 different enterprises developing different projects in the area.

Seminar on Environment and Development

The only environmental event identified as being related to union activities was the Seminar on Environment and Development organised by the National Confederations of Commerce, Industry, Agriculture and International Commerce.

The seminar was held to discuss the role of participation of these confederations in the United Nations Environment and Development Conference - ECO- 2, programmed for June 1992 in Brazil.

The seminar involved six panels in which the following topics were discussed:

- **Panel 1**
  The relationship between the government and the private sector regarding environmental questions
- **Panel 2**
  The Amazon and its national and international aspects
- **Panel 3**
  International commerce and the environment
- **Panel 4**
  Public opinion and the environment
- **Panel 5**
  Environmental management
- **Panel 6**
  Technology and financial resources in sustainable development

The participants were mainly high-level decision makers from the government and private organisations such as the Minister of Industry and Commerce, the presidents of the National Confederations, directors of industries, the Federal Environment Secretary, the General Secretary of the Organisation of American States - OAS, the Brazilian representative of ECO-92 and other participants and organisations.

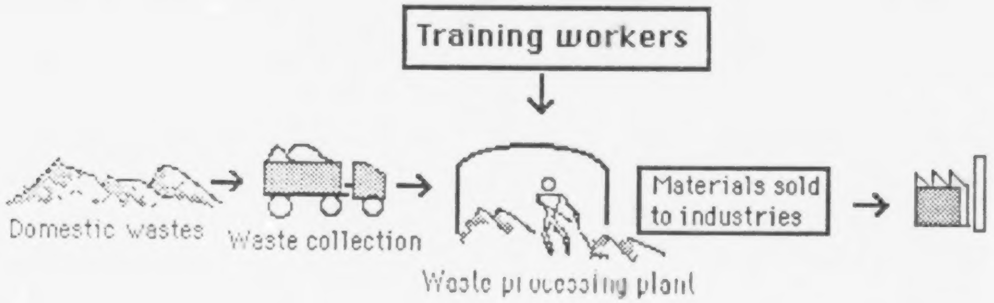
C. Environmental labour training at the municipal level

The Town Hall of Arraial do Cabo (a small town with approximately 10,000 inhabitants, located in the northern part of Rio de Janeiro State), has implemented a small scale waste recycling and composting plant, executed by the State Environment Engineering Foundation - FEEMA.

The basic objective of the project was to instruct technicians from the town hall on how to install and operate a waste recycling plant for urban and domestic wastes. The plant has been running for seven months.

The project is very simple and is operated by 50 workers (earning around U$ 100 per month each). It selects materials such as plastics, paper, and glasses including organic materials for compost production. After separation, these materials are sold to be recycled and re-utilised by specific industries.

This scheme is outlined on the next page:



All the workers were trained by FEEMA to operate the plant, which caters to around 20 thousand inhabitants from the municipalities of Arraial do Cabo and Monte Branco.

D. Conclusions

Environmental labour training is recent in Brazil and very few organisations in the country are involved in it. These are mainly SENAI, CETESB and FEEMA, although some small examples have also been developed by state environmental agencies.

SENAI's training system is of a high standard, comparable to the best European and North American training institutions. It has progressively been introducing environmental training events into its programme for the past decade. The main areas with which it has been dealing are effluent control and treatment of tanneries, textile industries, chemical industries and more recently effluent and solid wastes from agro-industries. It has been training students from all over Brazil, in addition to those from other Latin American countries and preparing them for the labour market. It has also provided technical assistance for industries and trained workers on special effluent control schemes.

In 1965 SENAI founded a leather industrial processing school in Rio Grande do Sul which is providing several courses on effluent control and has assisted 26 industries and several environmental organisations.

Price competition in the international leather market is very great and environmental control schemes in tanneries typically increase the prices of finished products. Before Brazil started the SENAI-UNIDO effluent control project (sponsored by the Italian government), it had a competitive price in the European market, together with Italy, Germany and Spain. With the development of training activities and the introduction of effluent control schemes in Brazilian leather industries, the country ended up losing its share in these foreign markets, but has gained in having less polluted rivers and environmentally clean industries.

SENAI has also recently set up effluent treatment pilot plants for agro-industries in Rio Grande do Sul, Paraná and Santa Catarina. Prior to 1987 68 students had already been trained.

Environmental training provided by SENAI is normally copied or adapted from classical technologies largely used in developed countries. These are normally transfered by technical co-operation projects with international organisations such as UNIDO and UNDP.

Workers' organisations and confederations such as CUT, CGT and CONTAG affirmed they were doing practically nothing in terms of training workers in environmental topics.

A small but interesting case study was identified in Arraial do Cabo, a town with 10,000 inhabitants which is part of the municipality of Rio de Janeiro. The town hall, with its environment-oriented programme, has implanted a waste recycling plant in which 50 people were trained by the state environment agency - FEEMA, in waste recycling techniques to work in the plant.

VII. Alternative environmental education and training

In 1990 there were around 800 NGOs in Brazil most of them engaged in socio-ecological affairs regarding human rights, support for the poor, support for the negro community, neighbourhood associations and other specifically oriented activities.

The growing public awareness of environmental matters, influenced by the media through means including the results of environmental studies carried out by the international scientific community and the forthcoming United Nations Environment and Development Conference - ECO 92 , has stimulated many small groups to organise and form entities in helping preserve and control the environment.

Several groups of NGOs were contacted in order to see how they are contributing to environmental training and education in different parts of Brazil. These organisations were mainly the Chico Mendes Memorial and Institute for Amazon Studies - IEA, Health and Happiness Project, Cultural and Natural Resources Preservation Society from the Amazon Region - SOPREM, Brazilian Institute for Research and Environmental Studies - PRO-NATURA and the Environmental Association for the Araruama Lagoon Region - AMARLA.

Other alternative initiatives also approached were the first ecological television in Brazil "TV Buzios", the environmental and religious linked education project to protect the "caatinga" vegetation developed by the Federal Rural University of Pernambuco State-UFRP, the Alternex computer communication network including the environmental training activities developed with prisoners from the Agriculture-Colony State Prison located in the State of Rio Grande do Sul.

A. Chico Mendes Memorial

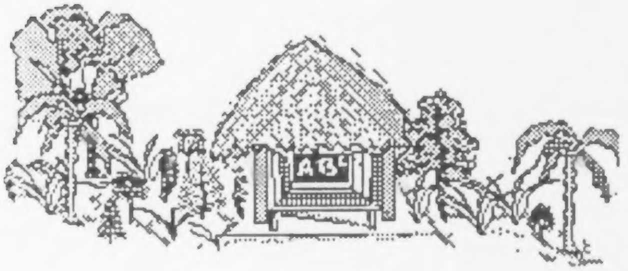
Chico Mendes was a rubber tapper who led a movement against the destruction of the Amazon forest and the disruption of the forest community. He was assassinated on 2 December 1988 by local cattle range farmers.

The memorial was created in 1989 and is localized in the Gutierez park (a small reminder of the tropical rain forest), in the city of Curitiba , State of Paraná. Both the memorial and the Institute for Amazonian Studies - IEA (which is responsible for developing cultural and educational studies in the Amazonian region), are administered by the municipalities of Curitiba.

What can be seen in the park?

Several interesting things can be seen in the park. For instance the mineral water fountain can be used by locals for their drinking needs. There is also an exact copy of an "Amazonian school", that is made of natural materials (e.g. tree trunks and palm tree leaves), brought specially from the Amazon forest.

The school is being used to teach local people how to read and write including meetings and environmental education classes for children.



The general idea of the project is to inform locals about the Amazon community and their daily lives in the Amazon forest.

There is also a"tapiri", a typical habitat of the Amazon rubber tapper and his family just beside the Amazonian school. The combination of school and house is called "colocaçao", which is normally set up beside an "iguarapé", a small creek that provides water for the "colocaçao".

Part of the forest in the park is open to the publicas a leisure area as well as for environmental education. The other part is closed for preservation and maintenance of bio-diversity.

The memorial has a building (200m^2) with several rooms such as a library, exhibition hall and conference room. The building is currently used for four sub-projects:

- **Environmental workshops**: theatre, games, body language, and literature
- **Information and training**: training for people to work in environmental education through seminars, talks, panels and debates.
- **Art and the environment**: uses several means of artistic communication to illustrate environmental problems in modern society, mainly through videos, films, theatre, dance and music.
- **Study of the Gutierez forest and surrounding areas**: studies the fauna and flora from the forest and encourages participants to make friends with people living in the surrounding areas. It also has a photo exhibition hall with a permanent exhibition about the life of the forest people in the Amazon region.

B. Institute for Amazonian Studies - IEA

The institute is also located in Gutierez park and has been developing a number of activities such as research on the Amazon region, supporting pro-Amazon movements and disseminating information about the region.

It has worked and produced studies in recent years with the Environmental Defense Fund - EDF. an NGO situated in the US.

Both the Chico Mendes Memorial and IEF are located in Curitiba for several strategic reasons. For instance access to information is easy, public opinion is well formed, the possibility of raising funds is better and because the area is located close to where big Brazilian enterprises work and where some important governmental decisions are made regarding national development action.

The institute also supports the creation of extraction reserves in the Amazon region including activities developed by the National Council of Rubber Tappers - CNS.

Projects developed by IEA

IEA has developed two basic projects related to cultural and environmental education activities and the recuperation of the environment. The first project aims at qualifying the people that live around the park in environmental matters. This is done by integrating them in environmental activities such as tree planting, fauna observation and waste recycling.

The project has also developed several activities to improve the public perception of environmental affairs such as public classes, slides, video shows and debates on environmental issues.

Environmental education activities have involved the participation of local associations, unions, universities as well as public and private schools.

IEA has undertaken training in: eco-development: the Amazon and its inhabitants and social movements: rural/urban environmental problems; Gaia - the possibility of being ourselves; extraction reserves and tropical humid forests.

The IEA's environmental recuperation project, for instance, has undertaken several activities and discussions on topics such as the relationship of plants with human beings (social-plant relationship), flower surveys, planting of native species in forest areas and the study of tropical forests.

Resources for IEA

Financial resources given for IEA are mainly from humanitarian funds, international foundations and enterprises, NGOs, and governmental organisations. This has enabled IEA to plan several activities for 1991 including New Age programmes, as seen below:

- Environmental affairs in the park: special events each month
- 22 April: Earth and Children day celebration
- Waste control campaign
- Energy saving campaign
- Workshop on alternative food, health, bodily exercise, massage and self massage (how to take care of yourself and others)
- Dance sessions

- Theatre, games and plays
- Music sessions
- Creative art sessions
- Video sessions
- Exchange market

IEA activities for the next five years

IEA has planned the following activities for the next five years:

- development of training courses on forest anthropology and sustainable natural resources utilisation
- editorial documentation project: development of an information network system and the production of periodic publications such as "The Forest Journal"
- dissemination and co-ordination of information about the Amazon forest and its inhabitants, including sustainable and alternative natural resources utilisation
- research on primary and secondary information survey of the Amazon forest resources and alternative economic utilisation.

C. Health and happiness project - A community experience in the Amazon Region

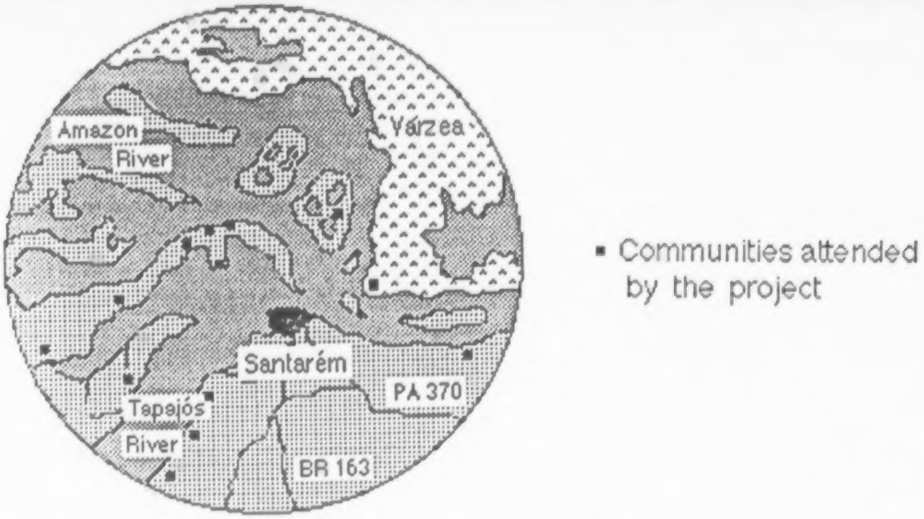
The Amazon is an invaluable heritage of mankind, with most of its area lying in Brazil. It is one of the last frontiers still undergoing active settlement.

Uncontrolled destruction and occupation are placing the region in a serious situation that calls for immediate action, not just because of environmental degradation at alarming rates, but for the people living there.

There is a lot of talk about protecting the Amazon, though little about the "caboclos", people of mixed Indian and white ancestry, who actually live there. Currently there is an immediate need to adopt measures whereby areas are reserved for forest, native population and "extracting activities".

The project

The project is located in Santarém in the State of Pará in the middle Amazon. It restarted in 1988 with funds from the National Social Development Bank - BNDS, the Federal University of Pará - UFPA and the Oswaldo Cruz Foundation - FIOCRUZ. Other financing institutions (in 1990) were included later such as UNICEF, Conservation International, Environment Secretariat of the Presidency - SEMAM-PR and the National Environment Fund - FNMA.



The project is an experimental and inter-disciplinary community development experience combining health, environmental education, art, communications and rural production in developing areas. It operates in the rural area of Santarém in 16 communities and 94 river-bank settlements, with a target population of 25,000 inhabitants.

Objectives of the project

The main objective of the project is to devise appropriate ecological means for community development in the area by triggering a process of comprehensive human and environmental improvement based on peoples' participation and the utilisation of human, cultural and natural resources available at each locality.

The project involves community training and the development of appropriate technology whereby institutional action endeavours to ensure a full range of technical support so as to offer encouragement and train people to take an active determinant role in their own development.

Its headquarters are in Santarém and it has an interdisciplinary team consisting of doctors, nurses, agronomists, a veterinary surgeon, educators, artists and others. The 32-member staff - technicians and assistants- are divided into seven sections[6] as follows:

- Health
- Education
- Art
- Communication
- Information and research
- Rural production development
- Administration
- Education

The above-mentioned team makes regular visits to each location on an average of once a month for three or four days. The different sections travel either in groups or separately, depending on the specific programmes to be developed.

The staff present themselves in the form of a circus called "Mocorongo" Health and Happiness Circus ("Mocorongo" meaning a native of Santarém). The performances take place at night in community centres, attracting crowds eager to participate. The "Circus" reflects everyday activities through educational skills, dancing, music and folklore, including the discussion of community problems. Every one becomes an artist (e.g. children, parents, farmers and others).

CIRCO
MOCORONGO

In general artistic activities and the circus have been the key expressions for the entire project and are the key tools for education, participation and human interaction.

During the visits extensive educational activities are developed, with an attempt to involve as many people as possible from all areas and age groups. The days are therefore very busy and a large portion of the population is mobilised.

The project is implemented in six stages, gradually extending its scope, depending on the main concerns and tasks that arise. At each stage, there are training and education activities for each respective programme and scheduled period.

Education and culture section

Environmental education is the master guideline behind the whole process. It seeks to increase self-awareness and environmental consciousness among the people, while providing them with the tools to interact with nature and improve it.

There are four basic objectives, namely to:

- expand the level of formal and universal knowledge among the people
- awaken the learning process within each individual
- revive local culture and identity
- create environmental consciousness among residents of all ages.

The project is also responsible for providing pedagogical support for every educational process involving schools, making them centres for generating knowledge, participatory research and cultural rebirth.

Child health and happiness

This task is carried out by students and teachers designed to train youngsters between the ages of seven and 14, encouraging and preparing them to work within their families and to take care of their younger siblings, imparting notions of health, hygiene, ecology, farming, art and theatre.

Formal education

The formal education section encourages and diversifies study groups so that they will fill the role of "educational and cultural agents", who can explain the project to the community as a whole. They will deal with environmental matters and community sanitation subjects. The methodology is adapted from the first to the fifth grades of primary school.

Environmental health

Training of health monitors enables participants to learn practical and theoretical skills in the treatment of common illness, first aid and healing methods, as well as in recognising signs of danger and facilitating treatment during the early stages.

In the hygiene and sanitation programme the group works at the level of personal and family hygiene, with absolute emphasis on the treatment of drinking water (through chlorination) and building and improving toilet facilities.

Other activities

Other activities developed by the project are seminars on the following topics:

- Amazon studies: study of the environment and ecology
- Development of the Amazon: present and future perspectives
- Living together and art activities
- Local culture and the environment

Activities developed in 1990

Some relevant activities developed in 1990 regarding environmental education and training are listed below:

section	trips	visits	days in the field	population
health	56	81	248	5.077
education and art	26	70	145	8.666

Health programme

Education and health activities are conducted with the population in general (talks, theatre and other activities).

Subjects include health and ecology, life disease cycles, water and hygiene alert (water, waste and sanitation) and local diseases.

The project has increased individual and collective responses to matters of health through training health workers and establishing actions based on priorities: health education, hygiene and sanitation, nutrition, integrated health for women and children, epidemiology control, dental hygiene, simplified treatment of health problems and monitoring of health indicators (participatory diagnosis).

Education and arts programme

Environmental education training activities include:

- number of teachers trained: 44
- environmental education events: 6
- local teachers meeting: 56 participants
- waste collection circus: 8 schools, 320 children
- talks about the Amazonian ecosystems: 280 participants
- environmental education workshops: 670 participants

D. Society for the Preservation of Natural and Cultural Resources of the Amazon Region - SOPREM

SOPREM was created in 1968 in order to protect and conserve Amazonian fauna and flora as well as to develop environmental education schemes for community participation.

SOPREM

In 1972 the society began developing a rural environmental/cultural programme with the Federal University of Pará - UFPA in order to train students during a period of ten years in the field. The programme included the execution of several environmental education courses for the local population.

It developed annual meetings with local people from the "Tapajós" River on environmental education action supported by school teachers and university students.

SOPREM has also been involved with the Catholic mission in the region to disseminate environmental education information regarding the "community forest" (which are considered preservation units), to fix the local population in these areas in order to avoid rural migration and consequently environmental degradation due to deforestation.

It has worked with the Brazilian Movement for Teaching to Read and Write - MOBRAL to expose certain communities to several environmental activities such as tree planting, development of vegetable gardens, development of handicrafts and other cultural activities.

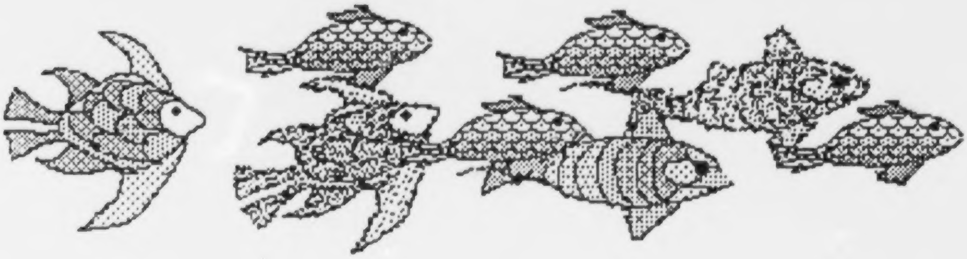
Finally, SOPREM has supported the inclusion of environmental events in primary and secondary school curricula such as the Conservation Week for Endangered Fauna (e.g. the Amazon dolphin and tortoise day). The event is celebrated by a community party once a year, in order for the population to link conservation with celebration.

E. Environmental Association of Araruama Lagoon Region - AMARLA

The Araruama Lagoon region is located in the northern part of Rio de Janeiro. The region boasts a beautiful beach resort which has very intense tourist activity all year long, with a peak flow of tourists in the summer months. In the past 20 years tourism has gradually generated environmental problems such as disorganised urban expansion, deforestation, pollution of lagoons and beaches, degradation of the sand dunes system and generation of tons of domestic wastes.

For this reason AMARLA was created in 1978 to develop environmental activities. It has been working with only six people who use use their own houses, cars and other personal infrastructures to carry out the organisation's objectives, namely to:

- stimulate the creation of parks and ecological reserves
- develop studies and research on environmental conservation
- disseminate environmental conservation information
- help educate and inform local children and youth through school activities
- preserve the local fauna and flora.



The environmental education activities are oriented towards highlighting local ecological problems and the preservation of historic patrimony[7] and cultural heritage.

The basic environmental education events AMARLA has developed since its creation have been:

- organisation of underwater waste clean-up in the "Itjurú" canal
- conferences given about AMARLA's environmental activities
- talks and an ecological film presentation in all municipal schools
- a tree planting campaign in which 2,000 trees were planted
- ecological classes given in the Cabo Frio Oceanographic Project
- development of environmental education brochures
- waste collection in the "restinga" sand bank area
- development of educational videos on the main environmental problems of the region.

F. Brazilian Institute for Environmental Studies - Pró-NATURA

Pró-NATURA is an organisation oriented towards the introduction and administration of conservation areas for private and governmental organisations.

It was created in 1986 and has a working multidisciplinary group of 15 full-time members at their headquarters, located in the city of Rio de Janeiro.

The institute has developed a planning strategy to orient action for better results in nature conservation and environmental awareness amongst the general public. It has been developing the following activities over the past five years:

- selection of significant areas for conservation
- project development for conservation areas
- development of a convention with the Brazilian Institute for Natural Resources and the Environemnt - IBAMA
- setting up basic infrastructure in the conservation areas
- monitoring the conservation areas
- maintenance of the conservation areas

- working with the community near the conservation areas and providing them with environmental education

The environmental education activities are mainly talks given for the local population and the distribution of folders/brochures in schools.

The conservation areas where Pró-NATURA is responsible for administration and developing environmental education schemes are:

- National Marine Park of Abrolhos Island in Bahia State
- State Park of "Ilha Grande" (Great Island) in Rio de Janeiro
- "Ilha Grande Biologic Reserve
- Private park of Juréia in the Amazon region
- "Serra do Cipó" (Cipó mountain range) in Minas Gerais State
- Desengano Park in Rio de Janeiro State
- Conservation of the Atlantic Forest: the project is being set up and involves several states
- Laurado do Maurai in Roraima State

G. Cultural and Radio Dissemination Foundation - TV Buzios

Buzios television station was created in 1988 with the objective of being the first ecological and social television station in Brazil. It is a very small station which currently repeats some programmes from the governmental educative television network - TVE and the privately owned Rede Globo and SBT Televisions. But TV Buzios has its own independent programmes which occupy most of the "on-air" time.

The master philosophy of the station is to be simple and to adapt all programmes to the local and regional situation of a developing country.

It has developed several ecological, scientific, educational and musical programmes in which people such as technicians from the government, local people (e.g. fisherman), including artists, are invited to perform or to debate subjects ranging from environmental problems to new age music.

It is also considered a democratic television station because both the local community and some environmental organisations from Rio de Janeiro, such as the Environment Engineering

State Foundation - FEEMA and the Institute for Forestry - IEF participate freely in the ecological programmes it develops.

The station is financially supported by ecologically-oriented commercials developed for local enterprises.

Why ecological television?

The town of Buzios is located in a very well-known tourist area in the northern part of Rio de Janeiro. It became very famous when the French actress Brigitte Bardot lived there for some time in the 1960's. It is a very small fishing town but frequented by magnates, artists, and national and international tourists.

The Brazilian coastal zone has one of the most fragile ecosystems in the country, and has been degraded intensively by deforestation, disorganised urban expansion, the negative impact of tourism, water pollution due to domestic sewers, soil erosion and other destructive factors.

Buzios has some of the most beautiful marine scenery and beaches in Brazil. But the town and its neighbouring municipalities are in the process of being severely degraded by the above-mentioned factors. The station was therefore strategically located in Buzios for three basic reasons. The first, to be a dynamic instrument for the solution of existing environmental problems, to use the fame of Buzios as a natural attracting pole and last but not least, because the ECO-92 (June 1982) will be developed in Rio de Janeiro, just 150 km away from the town.

Environmental education programmes

Almost all programmes developed by the television, including commercials, are oriented towards the solutions to and awareness of local environmental problems. For instance one of the main problems in the region is lack of sewage treatment systems, therefore almost all the sewage, produced mainly by households, hotels and restaurants, is discharged into water sources (e.g. the sea, lagoons and canals). For this specific problem the station has developed a commercial that explains how to develop an anaerobic (bacterial digestion process without using free oxygen) inexpensive sewage process in order to avoid water pollution.

Television programmes

Some of the programmes developed by the television on ecological and environmental aspects are:

"Ecologiando"

The programme interviews people, shows images of environmental protection and destruction and opens perspectives for alternative solutions regarding environmental and community problems in the region. The programme has presented the following topics:

- the Earth Day and the protection of the white dunes in Arraial do Cabo
- protection of "Geribá" lagoon
- creation of the environmental protection area - APA of Sant'ana archipelago
- waste recycling plant from Arraial do Cabo
- the life of Sao Joao River
- pollution problems at "Praia do Canto" beach
- the mangrove life
- ecological walk to "ponta da Sapata" point
- Vicente the ecological canoe traveller

The programme has also interviewed various people about ecological topics such as the president of the German Green Party, the Governor of Rio de Janeiro, the Deputy of the Brazilian Green Party - PV, Pelé, Sting, physicians, artists, local fisherman and others.

It's Easy!

This programme presents simple musical clips of 60 seconds each in order to teach people about household affairs, including ecological activities such as planting a seed, fixing a water pipe, fixing electric cables, first aid and others.

Nature conditions

Presents the climatic conditions in the region with meteorological data.

Live programme

This programme offers live interviews with people concerning all possible topics (e.g. art, police, politics, music, religion and others) and ecology.

Results since the establishment of the television

It is possible to affirm that after three years of work and several difficulties due to a pioneering initiative, the television has had some interesting practical results. One of the main points is that the audience has grown considerably since the creation of the station because it has attracted the attention of the regional population. The second is because it mainly deals with (and often helps in the process of solving) important social and environmental problems in the region. The third reason is related to the growing popularity of the station in the region. It currently reaches seven municipalities: Buzios, Cabo Frio, Arraial do Cabo, Sao Pedro d'Aldeia, Araruama, Rio das Ostras and Barra de Sao Joao, which have a high increase in population per annum.

The resident population of the above municipalities is around 373 thousand inhabitants. During winter vacations the population grows up to 620 thousand inhabitants and during the summer vacation it reaches 2.5 million inhabitants. The potential television spectators are 255 thousand inhabitants and the number of commercial establishments in the area is around 3.5 thousand.

The development of ecological programmes has helped stimulate the creation of several environmental NGOs in the municipality of Buzios, including some community associations willing to work on social and ecological questions in the region.

The station has also been opened to independent programmes both for institutions and private enterprise.

Environmental state and federal organisations such as FEEMA, Secretariat for Rivers and Lakes - SERLA, Municipal Environment Council - CODEMA including the regional Brasilian Institute for Natural Resources and Environment - IBAMA, have free access to give educational information on environmental matters and use the television to control and denounce environmental problems.

The television has turned out to be a reference point for the regional community where denunciations, discussions, announcements and other activities are developed. This is mainly because the local community knows that the television will do something for them in terms of solving their problems after they have lost their expectations with the local Town Halls and sometimes with the State governments.

A typical example has been the case of a restaurant that was polluting a small bay with sewage. The local fishermen used the television to denounce the irregularity and the restaurant, to avoid losing its clients, halted the polluting activity.

The television has also shown several illegal construction activities in the area. After several denunciations on television, before constructing new homes developers now request information themselves about the legal procedures to be followed in developing new buildings in order to avoid environmental problems.

The television station has recently developed a campaign to remove all outdoor commercials that carried a risk of traffic accidents and negative visual impact in recreational areas such as beaches, dunes and other touristic areas.

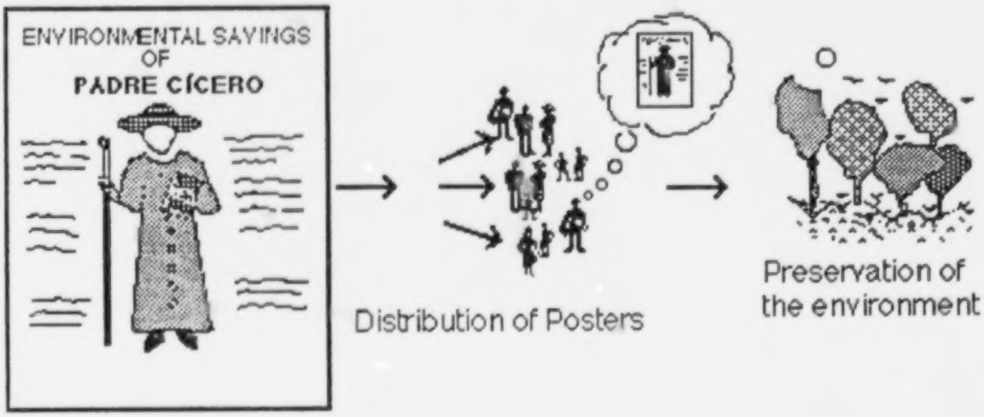
H. Religiously linked environmental education project

The desertification process in the "sertao"[8], partly located in the State of Pernambuco, is very intense. This is due not only to the climate but also to human activities such as deforestation and fires in the region.

The environmental education campaign to protect the "caatinga" was created by the late Professor Vasconcelos Sobrinho (the pioneer in desertification studies in Brazil).

The programme simply consisted in distributing posters in several towns and villages of the "sertao region", in order to minimise deforestation and fires by the population.

The great idea of the campaign was to join ecological action with the religous beliefs of the population, therefore the posters were printed with the figure of a very well known and respected priest "Padre Cicero"(known by locals to have performed several miracles in the region). The poster contained his ecological sayings for the "caatinga", such as "do not chop trees", "do not hunt", "do not set fire to the Bush", "plant a tree every day" and others. The idea of the campaign is illustrated below:



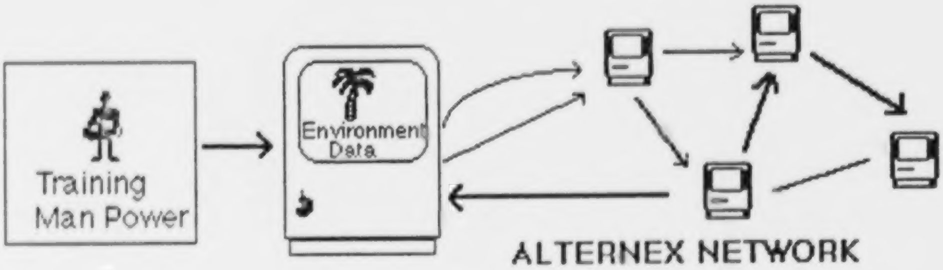
The campaign was successful for two simple reasons. The first, because part of the degradation stopped, mainly around the ecological station of "Tapacurá", from where it was launched and second because the programme was inexpensive. It was financed by a local supermarket and supported by the Federal Rural University of Pernambuco - UFRP.

I. Alternex computer communication network

Environmentalists in Brazil are now able to communicate environmental information world-wide. A computer system was set up by the Brazilian Institute for Social and Economic Analysis - IBASE, in Rio de Janeiro.

The system is called ALTERNEX and is part of an international network co-ordinated by the Association of Progressive Communication - APC, located in the US.

The system enables people to communicate world-wide with their personal computers. For instance information on deforestation in Indonesia can be transmitted to an NGO in Sao Paulo, or alternative sewage system control from The Netherlands can be utilised in Nigeria.



The programme is financed by the United Nations Development Organisation - UNDP and has 400 users in Latin America, 300 from Brazil. All users have free courses on how to utilise the system which contains environmental subjects ranging from four thousand forestry topics to homeopathic medicine.

NGOs such as the S.O.S. Mata Atlantica group and the syndicate leaders from Paraná State have been using the sytem to exchange information regarding ECO-92.

J. Agricultural colony prison of Mariante Municipality

The prison is located in the State of Rio Grande do Sul and has been not only developing agricultural and aqua-cultural activities but also has recently set up a training scheme for the prisoners to produce tree seedlings.

Seventy-eight prisoners are producing and taking care of native species for a state reforestation project. In 1990 around 500 thousand trees were produced by the colony and sold to the State Agriculture Secretariat.

K. Conclusions

There are more than 800 NGOs in Brazil, most of them are small groups acting locally but working on global community and environmental issues. The number is growing, stimulated by the international scientific community and public opinion as well as awareness of environmental issues world-wide and local environmental problems.

NGOs are very important examples of non-conventional approaches in solving environmental problems and preventing new ones. Most of the NGOs contacted demonstrated innovative, original and inexpensive ways of developing environmental education and training activities.

One of the very positive points of the action developed by the NGOs, in relation to government initiatives, is that the former have been developing environmental activities directly with the public, indeed, they often form part of the public. Government initiatives have had less success due to a worn out image of not carrying on projects or simply abandoning them.

Some NGOs are sponsored by international foundations or by well structured NGOs and others have financial support from the government. But most of them work with their own money, good will and effort.

The health and happiness project is a very interesting example of how environmental education and health care can be provided to the local population in the Amazon region in order to enhance their quality of life. The idea of developing their activities as a circus has been successful and well accepted by 16 communities and 94 river bank settlements, corresponding to around 25,000 inhabitants.

The Chico Mendes memorial and IEA have also been developing several environmental education and training activities which. For the next five years IEA is planning to increase the number of training courses and environmental education activities. The memorial is planning to go beyond (external) environmental education activities by also creating a space for the inner body environment. These activities are being developed under the new age perspective in which workshops on personal body care and natural prevention and healing techniques are organised for the general public.

One of the most outstanding examples has been the religiously linked environmental education campaign supported by UFRP and financed by a local supermarket in 1983.

A very innovative and alternative proposal for environmental education has been the establishment of the first ecological television in Brasil - TV Buzios. The programmes developed by the television are all community and environmentally orientated, and reach a potential public of 255 thousand spectators.

Two new stations are also almost operational: The ECO-TV in Paraty8, State of Rio de Janeiro and GAIA-TV in Guaraparí, State of Espirito Santo. Future plans are to implement 106 of these television stations around the country.

VIII. Final conclusions

Although Brazil has several interesting environmental training and education case studies and growing experience in this field, there is still a great lack of trained people capable of efficiently managing and controlling environmental resources.

Environmental education also plays a very important role in this process because the great majority of the population still have very little awareness and lack of common sense in preserving the environemt. What has been observed lately are some fashionable environmental events such as shows in large cites with known artists or people wearing T-shirts with environmental messages or even ecological events on a Sunday beach. It has to do more with "environmental fun" rather than " real effort to solve environmental problems". This has been mainly stimulated by the Conference on the Environment and Devlopment - ECO 92 held in June 1992.

In general terms the environmental conservation idea amongst the population is growing little by little in the country and comparatively is far better than a decade ago.

Going back a little in time, the Brazilian colonial past contributed to the initial kick in environmental destruction through the exploitation of high grade timber and deforestation for agricultural development.

Later in the 1950's, industrial activities that reached the country sought purely productive and economic growth and till the late 1980's industrial development was a "must" based on the economic and technological style adopted by the developed countries. Mega-projects developed in Brazil such as the Itaipu dam, the Trans-amazonian motorway and the Carajás project. These represented the best method decision makers from the government found in making Brazil a fast pre-developed nation, but this development process was certainly the worst solution for the Brazilian environment.

The adoption of this style led to increased inequalities between regions and social groups and also harmful effects on human health.

The Brazilian development style has not changed much but it has been restrained by sophisticated environmental regulations which began with the new Constitution and continued with the National Environment Policy including State legislation and specific municipal laws.

Law no. 6,938 created the National Environmental System - SISNAMA which theoretically links all state and municipal environmental organisations of the federation and is responsible for implementing the National Environmental Policy.

The system works relatively well in the rich states such as Sao Paulo, Rio de Janeiro, Minas Gerais, Paraná, Santa Catarina and Rio Grande do Sul, but in the less developed ones located in the Northern and North eastern part of the country the system fails. This fact can be observed not only by the number of environmental problems but the delay in solving them. Regional disparities are also a limiting factor for dissemination of information, therefore environmental training and education is very limited in these areas which means not all states have the same opportunity for improving human resources. For instance, while Sao Paulo, the most productive state in the country trained and provided environmental education information for more than 54,000 people in 1990, the less developed states did practically nothing in the same year.

In general terms the environmental world wave reached Brazil firmly in the 1980's, although before that the government had already developed action to control and minimise environmental damage.

The government began implementing new structures and organisation to deal with the demand for work and responsibilities for environmental administration, management and protection due to existing laws and environmental problems.

The wave also stimulated the creation of several non-governmental organisations - NGOs - mainly in large towns and cities to work with alternative solutions to environmental problems.

The Brazilian government has been increasing investments in environmental education and training mainly in teaching institutions such as universities. There has been a gradual introduction of new environmental programmes mainly at the post-graduate level in order to form an "elite" of very specialised people to work in environmental administration and management. But the country lacks undergraduate courses (such as environmental planning, environmental impact assessment - EIA, landscape planning, environmental administration and environmental control), to train less specialised people to work with the country's environmental problems.

A positive point for certain under-graduate courses such as geography, biology, agronomy, social studies, architecture and urban studies has been the incorporation of environmental subjects into their "curricula". For instance the engineering area, which in the past had nothing to do with ecological and environmental affairs, now includes such subjects, and generates a multi-disciplinary vision of the environment.

The environmental business market in Brazil has also grown considerably in the last decade with large engineering enterprises creating special divisions to provide environmental services. There has also been a "blooming" of many small firms dealing basically with environmental impact assessment - EIA - due mainly to a Federal Resolution from the National Environmental Council - CONAMA in January 1986, establishing EIA as obligatory for development projects in the country.

The resolution actually worked like a birthday cake at a children's party: everyone wanted to have a piece of the rich market. Firms from the Amazon region all the way to the south were preparing environmental "package" studies according to the guidelines of the Resolution.

As a result the market generated many opportunities for private initiatives and consequently grew tremendously but with very low quality because of lack of trained people in the field. The situation created on one side was firms producing low quality reports and on the other, the government having no trained people to analyse the reports.

Alerted to this fact state organisations such as CETESB from Sao Paulo - and FEEMA from Rio de Janeiro and even IBAMA at the federal level began organising and structuring events not only to train technicians to analyse the documents produced by private firms but also the people linked to the firms that were producing the reports. The level of the studies became slightly better in the above mentioned states but the rest of the country still lacked (and lacks) knowledge in this field.

Many national training courses were organised by some universities including the above-mentioned organisations in order to fulfil the existing gap of trained people in the country, but again lack of funds permitted limited events only which informed participants rather than trained them to work on practical procedures.

Vocational training in Brazil plays a very important role in the teaching process. It is mainly restricted to SENAI and some courses organised by CETESB and FEEMA. The former have four schools which provide highly qualified training to train medium level technicians mainly on effluent control of tanning, chemical and textile industries including water sanitation schemes.

SENAI has concentrated basically on effluent treatment but has left aside several other demanding areas such as forestry, soil management and air quality control. These areas have been partially covered by courses developed by CETESB and FEEMA which are developed mainly for professionals working in Sao Paulo and Rio de Janeiro. But again the less developed states are left in general terms with no regular training activity except for special cases when specific training is contracted by governmental organisations.

SENAI's effort on effluent control training is mainly a priority established by the Brazilian Industry Confederation which in turn is an adaptation to water quality regulations enforced by the government.

Environmental training has also been a concern of national and international financing agencies such as FINEP, CNPq, RHAE, including UNDP, the World Bank and the Inter American Development Bank. These organisations have been directly or indirectly sponsoring environmental training events in the country.

In the past, loans provided to the Brazilian government by international banks have been severely critised by the scientific community, NGOs, environmentalists and the public in general as having financed environmental destruction. In other words, the agencies and the government did not take environmental guidelines seriously into consideration for development projects which opened the doors to environmental damage such as in the cases of Tucuruí dam and the Polonoroest project in the Amazon region.

Financial support is now provided only on the condition that environmental programmes are carried out through the whole cycle of the project which in many cases means environmental education and training activities have been to be implemented.

Another interesting point to highlight is the persistence of the "syndrome of ecology" which continues to circulate around the high decision levels of the government. There is still a misunderstanding of what exactly the environment is and how it should be defined. The term environment has been substituted for the term ecology largely used in the past decades to define situations such as bird preservation, tree planting, air pollution or public manifestation against environmental hazards. With the environmental wave the term "ecology" was dropped and substituted for "environment" which for many decision makers may still mean the same thing.

This fact has been observed through government documents, written articles, talks and informal conversations. And if the term is not completely understood how can the whole environmental process be launched well enough in order to create an efficient feed-back?

As an example, two main sponsoring agencies in the country CNPq and CAPES are still utilising the term "ecology" as a sub-division for post-graduate studies relating to the environment. It is the same as fitting an elephant inside a Volkswagen "beetle".

Government enterprises such as ELETROBRAS, PETROBRAS, EMBRAPA FURNAS and EMATER have been showing more and more interest in incorporating environmental considerations in their development projects or routine activities. More training activities have been executed and not only has the internal staff has been trained but also people from other governmental organisations.

These enterprises have in some way or the other incorporated into their administration process the management philosophy which exists in international corporations and multinational companies, therefore they have tended to be self-sufficient in their decisions and plans. This has brought a certain isolation and their environmental initiatives often did not reflect the government's environmental action and decisions.

Some specific environmental courses developed for instance by ELETROBRAS and

PETROBRAS have covered a wide range of environmental subjects through theoretical and field classes, but they have practically involved no governmental agency in the organisation and execution of these events, which means developing their own procedures and perspectives. This might be positive on one side because they are ultimately creating know-how and developing new technological procedures, but at the same time they are creating opportunity for running into conflicts with governmental policies, plans and projects.

Last but not least are the alternative initiatives by private groups and NGOs. The term alternative means not very much engaged with the main stream which in turn represents the whole economic system that the developed world established and the third world struggles with.

NGOs are of the opinion that the main stream is being affected by several hydroelectric power plants and that new environmentally sound solutions must be found instead.

Most NGOs normally work on their own with no help from the government which means having very low funds to develop their projects. They have found practical and simple ways to solve local problems normally involving groups of people or whole communities. Their solutions work well most of the time because they are very well adapted to the social, economic, cultural, religious and ecological realities of the community and the area they are working in. This has been very positive in projects such as the Health and Happiness project and SOPREM in the Amazon region, Buzios Television in Rio de Janeiro and the Chico Mendes Memorial and the Institute for Amazonian Studies - IEA in Paraná.

NGO's have been working with low budgets but with good will which makes a difference because the work is spontaneous, creative and most important not too engaged with higher hierarchy. Some cases such as the Health and Happiness project have been partially financed by the government. This has been mainly because on the one hand, they were dealing with human health, one of the government's priorities in the social area and on the other hand, the idea besides being very original worked so well that the government could not say no.

The government may wish to say no to NGO initiatives because alternative paths in solving environmental problems such as providing environmental education and training have reflected its own failure in solving the same problems. In other words the NGOs have sometimes found more feasible solutions to local problems where the government has burned out its image through conventional approaches.

But sometimes the government itself has seen some light by developing interesting alternative projects such as the ecological buses in Paraná and the Federal District of Brasília, the alternative medicine garden by a primary school in Brasília, the religiously linked environmental education project in Pernambuco, the reforestation project of river banks by school children in Paraná, the waste recycling plant in Arraial do Cabo and stopping the circulation of cars for one day in the city of Sao Paulo.

This clearly shows the government's potential in generating and seeking new ideas and seeking new paths for sustainable development in the country.

NOTES

[1] The new Brazilian Constitution from 1988 considers that environemta education "should be promoted at all levels of education and public awareness in order to preserve the envionment" (article 225, paragraph VI).

[2] Courses from the Pollution Control Programme-PROCOP: The basic objectives of the programme are to finance pollution control projects as well as to preserve and improve environmental conditions for all Sao Paulo State. The project financing source is the Development Bank of Sao Paulo-BADESP.

[3] The subjects concerned are natural resource management, environmental impact assessment-EIA, ecosystem ecology, eco-toxicology and environmental information.

[4] The Brazilian Power Sector has 19 electric companies responsible for certain States or Regions. These companies are the following: FURNAS, ELETRONORTE, ELETROSUL, CHESF, CEMIG, COPEL, CEEE, ITAIPU, LIGHT, CEAM, CELPA, CEMAT, CERJ, COEBA, CPEL, ELETROPAULO and ENRSUL.

[5] EMATER has a central headquarters, 19 regional offices and 500 local offices in the State of Minas Gerais.

[6] For the present survey, only the sections education and health were taken into account in this report because they have a important role in environmental education and training activities.

[7] The region was one of the first in Brazil to be colonised by the Portugues in 1600.

[8] Where the caatinga vegetation, composed of cactus species, spine bushes, small trees with semi-arid climate is predominant.

[9] Paraty was declared by UNESCO as historic and cultural patrimony of humanity

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Annex I (a)

Past IBAMA Courses

Some training events developed by IBAMA (and the former SEMA) in the past have been the following:

- **6th Course on Environment Managment and Planning for Latin Americ and the Caribbean.** The course was designed for 35 participants from Latin America and the Caribbean region. The duration of the course was 450 hours/class
- **4th National Seminar on University and the Environment.** The seminar was organised to discuss the major role of Brazilian universities regarding environmental training and education activities.
- **Training Course on Environmental Control.** This course was designed for 35 participants from the environmental control and fiscalisation divisions of IBAMA.

Annex I (b)

Future IBAMA Courses

There are eight programmed courses with a duration of 120 hours/class each, as seen below:

Environmental Impact Study

- one national course
- two courses in the Amazon region
- two courses for the Pantanal region
- two courses for the sea mountain range region

Licensing, control and taxation

- (same system as above)

Conservation units management

- (same system as above)

Environmental zoning

- development of four courses

Public participation in environmental management

- one course

Environmental management

- one course

Environmental issues for development and planning

- one course

Environmental priority in the development sector

- one course

Seminars

There are three programmed seminars with a duration of 16 hours/class each, as seen below:

- Public participation in environment management
- Environmental management
- Legal instruments for public participation in environmental protection

Target groups

These courses are designed for the following target groups:

- Directors and technical staff from IBAMA including State and municipal organisations
- State and municipal governments, with special priority for the Amazon, Pantanal and Sea Mountain Range regions
- Directors and technical staff from IBAMA and municipal organisations from the above-mentioned regions
- Directors and technical staff from the economic, public and private sectors
- Representatives from social and community associations
- Environmental commissions from the court.

Annex II

Training courses for 1991

The following courses and practical training activities-TPES are programmed for 1991

Water Sector

- General courses
- Bacteriological analysis of water
  level (of participants): university and medium (technician)
- Water analysis for biocides residues
  level: unviersity and medium
- Collection and preservation of water samples
  level: medium
- Aquatic biological organisms
  level: university
- Methods for evaluating toxic pollutants in aquatic organisms*
  level:university
- Methods of concentration. Isolation and identification of salmonella in environmental samples
  level: university and medium
- Industrial water treatment system operation and control
  level: medium
- Bacteriological water analysis techniques: multiple tubes
  level: university and medium
- Investigation techniques on fish contamination
  level: university and medium
- Swimming pool water treatment
  level: medium

Water Supply

- Basic action to protect, clean and disinfect water reservoirs
  level: (Operational) university and medium
- Underground water control and pollution prevention*
  level: university
- Quality control of the main chemicals used for water potability
  level:medium
- Microbiological examination of water: simplified process
  level: university and medium

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* Refers to courses from the Pollution Control Programme - PROCOP: The basic objectives of the programme are to finance pollution control projects as well as to preserve and improve environmental conditions for all of Sao Paulo State. The source of funds for the project is the Development Bank of Sao Paulo-BADESP.

- Interpretation of the results of hydro-biological, physical, chemical and bacteriological analysis of a drinking water supply system
  level: unviersity and medium
- Laboratory technician for water treatment station
  level: medium
- Control and operation of a water supply treatment station
  level: medium
- Control and operation of a water supply treatment system
  level: medium
- Technical bacteriological analysis of water: Filter system
  level: university and medium
- Disinfection techniques for water supply
  level: medium

Residue Water

- Activated sludge and air lagoons: operation and control
  level: university and medium
- Micro-biology and anaerobic digestion
  level: university
- Micro-biology and activated sludges
  level: unversity
- operation of an anaerobic effluent treatment system
  level: medium
- Project, construction and maintenance of sewer systems
  level: university
- Residue water treatment for the leather and meat industry*
  level: university
- Residue water treatment for the pulp and paper industry*
  level: university
- Residue water treatment for the metal industry*
  level: university and medium
- Residue water treatment for the milk industry*
  level: university and medium
- Residue waste water treatment for the textile industry*
  level: university and medium
- Industrial sewer effluent treatment with anaerobic digestion of up-going flow*
  level: university

Air and Noise Sector

- Chimney sampling of statistics sources*
  level: university and medium
- Evaluation and control of noise and industrial vibration
  level: university and medium
- Adjustment and maintenance of chimney sampling equipment*
  level: university and medium

- Control technology for organic and inorganic vapour emission*
  level: university

- Industrial ventilation*
  level: university

Soils and solid wastes sector

- Industrial dumping: criteria for project implantation and operation*
  level: university

- Domestic solid wastes: treatment and final disposal
  level: university and medium

- Industrial solid wastes treatment: landfarming system*
  level: university

- Bio-degradation of liquid effluents from industrial solid wastes and soil pesticides*
  level: university

Special courses

- Environmental accidents: prevention and control
  level: university and medium

- Evaluation of environmental impact studies-EIS and environmental impact statements in the State of Sao Paulo
  level: university

- Experiment in control of environmental toxic components*
  level: university

- Environmental control in mining activities*
  level: university and medium

- Environmental conflict management: methods and techniques
  level: university

- Introduction to sustainable development: concepts and strategies
  level: university

- Economic instruments for pollution control*
  level: university

- Economic micro-biology*
  level: university and medium

- Environmental planning of coastal regions
  level: university and medium

- Principles of ecology and environmental pollution aspects
  level: university

- Urban process and the environment
  level: university

- Environmental radioactivity: causes and effects
  level: university

- Risk analysis techniques*
  level: university

Annex III

FEEMA training efforts in 1990

Courses for medium level participants

- **Bacteriological analysis of water**
  To train people to work in bacteriological laboratory analysis of domestic water containers. The duration of the course is 35 hours/class for 12 participants.

- **Swimming pool operator**
  To train people to clean and maintain private and public swimming pools also focusing on health aspects of swimming pool users. This course is in the greatest demand each year. The duration of the course is 12 hours/class for 30 participants.

- **Installation of household sewer treatment systems**
  To train people in the construction of alternative sewer systems for small homes. The duration of the course is 12 hours/class for 30 participants.

- **Disinfection and cleaning of household water tanks**
  This course was developed to support the Law no. 1.675, which makes it obligatory to clean the water tanks once a year. The duration of the course is 35 hours for 30 participants.

- **Gardening**
  To train people in developing reforestation schemes, development of gardens and small vegetable gardens. The duration of the course is 20 hours for 30 participants.

- **Control and Evaluation of Air Pollution**
  To train people in identifying air pollution effects on human beings, monitoring techniques and air quality diagnosis. The duration of the course is 40 hours/class for 30 participants.

- **Control of Rats and Cockroaches in Buildings and Homes**
  To train people to control these animals in apartment building and homes. The duration of the course is 24 hours for 30 participants.

- **Reforestation and Planting Techniques**
  To train people to work with urban reforestation and planting techniques for water source protection, natural soil protection, soil erosion protection and protection against the sun. The duration of the course is 40 hours for 30 participants.

Courses for university level participants

These courses are developed for participants holding an university degree and in some cases for participants who already have practical knowledge in the field. The courses offered in 1990 were:

- **Biological Treatment of Liquid Effluents**
  To improve technical skills and knowledge of trainees regarding the methods utilised by FEEMA. The duration of the course is 30 hours/class for 30 participants.

- **Bio-Experimentation with Aquatic Organisms**
  Theoretical and practical course to discuss different methodological approaches to perform toxicity test of aquatic organisms.
  The duration of the course is 40 hours/class for 30 participants.

- **Water Quality Evaluation**
  The course focussed mainly on monitoring, collection and analysis of water quality. The duration of the course is 40 hours/class for 30 participants.

- **Industrial Waste Disposal**
  The course focussed on the existing technologies for waste management and disposal of solid and semi-solid industrial wastes. The duration of the course is 20 hours/class for 30 participants.

- **Particulate Material Sampling**
  The course focus on the methods developed by FEEMA *to collect and measure particulated matter* from chimneys. The duration of the course is 30 hours/class for 30 participants.

- **Air Pollution Control Techniques and Alternative Systems**
  The course focussed on conventional air pollution control techniques developed by FEEMA. The duration of the course is 40 hours for 30 participants.

- **Control and Preservation of Pollution Accidents**
  The course focussed on prevention, combat and control techniques of emergency pollution accidents. The duration of the course is 40 hours/class for 30 participants.

- **Operation of Liquid Effluent Treatment System**
  The course was designed to train people already working in industrial plants. The duration of the course is 40 hours class fro 30 participants.

- **Biological analysis of Water**
  The course provides information on laboratory analysis and aquatic biology techniques for water sampling. The duration of the course is 40 hours/class for 30 participants.

- **Protection of Coastal Ecosystems**
  The course was designed to train people in conservation plans and coastal management. The duration of the course is 20 hours/class for 30 participants.

- **Environmental Impact Assessment-EIA for the Licensing System**
  The course was designed to train technical staff form several state environment agencies in Brazil. The duration of the course is 40 hours/class for 30 participants.

- **Community Participation and Environmental Impact Statement-EIS**
  The course was designed for the representatives of urban communities including NGO's. It explains the main steps of the EIA process with emphasis on the procedures and mechanisms of public involvement. The duration of the course is 15 hours/class for 30 participants.

- **Introduction to EIA and EIS**
  The course was designed for professionals interested in developing EIA's and EIS's, with emphasis on methods and techniques. The duration of the course is 40 hours for 30 participants.

- **Environmental Planning**
  The course discusses the methods and techniques to develop environmental planning in Brazil with emphasis on the State of Rio. The duration of the course is 20 hours/class for 30 participants.

Environmental Education Events

FEEMA has been developing several environmental education events in which a large number of people have participated ranging from Town Mayors to local people.

The most important events organised by FEEMA are the following :

- Fifth Municipal Conference on the Environment
- First Environmental Education Meeting
- Seminar on Black Smoke and Human Health
- Meeting on the Participation of the State Municipalities in the Environmental Question
- First Seminar on FEEMA's Control, Disinfection and Rat Extermination
- Techniques for Specialised Firms
- First Environment State Conference

- Seminar on the Recuperation of the Environmental Quality of Paraiba do Sul River Basin
- Regional Meeting on Environmental Education and the Project Environment Agents-AMA